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PROSPECTS FOR INDUSTRIAL DEVELOPMENT AND FOR A CAPITAL GOODS INDUSTRY IN INDONESIA

Volume I. Main Report*

Prepared by the

Regional and Country Studies Branch
Division for Industrial Studies

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The UNIDO Indonesia Industry Sector Study (UC/INS/82/106) comprises three volumes:

PROSPECTS FOR INDUSTRIAL DEVELOPMENT AND FOR A CAPITAL GOODS INDUSTRY IN INDONESIA

Volume I : Main Report

Volume II : Prospects for Industrial Development

Volume III : Prospects for a Selected Capital Goods Industry

- Part one : Survey of capital goods and engineering industry
- Part two : Long-term projections of demand for capital goods
- Part three : Capital goods production in developing countries international experience
- Part four : Potential for development of a selected capital goods industry

PREFACE

Within the framework of UNIDO's programme on country surveys and studies, analyses are made of industrial development prospects and structural changes of individual developing countries. The aim of the research programme is to assist national policy makers and planners in identifying long-term prospects for industrial development and in formulating policies and strategies for industrialization. This follows the general approach adopted for in-depth country studies to link analytical studies closely with the policy making process of developing countries.

Accordingly and in response to a request by the Government of Indonesia, UNIDO undertook this study, which covers analyses of the overall prospects for industrial development in Indonesia for the coming 10-15 years and provides an assessment of the scope for developing selected groups of capital goods industries based, inter alia, on demand projections. The study includes a review of processing equipment industry within the overall framework of industrial development and provides a basis for subsequent detailed technical and economic studies. The Government requested further, within the framework of the wider study, a report containing tentative recommendations on the potentials for domestic production of equipment for the following industries: coconut and palm oil, rubber, sugar, cocoa, coffee and tea, textiles, wood and cement.

This study was prepared under the direction of the Regional and Country Studies Branch in co-operation with a team of international consultants. In support of the study, a field mission was undertaken in October-November 1983 to collect data and interview Government officials and representatives from industry, and also to visit a number of industries throughout the country. The UNIDO team was headed by Torben M. Roepstorff of the Regional and Country Studies Branch and consisted of: Atif Kubursi, Peter Manoranjan, Karl Heinz Plaetzer and Marc Dreyer. H.W. Arndt, consultant, contributed some of the analysis and was responsible for much of the final drafting. Arie Kuyvenhoven and J.C. Jansen of the Netherlands Economic Institute were consulted on selected issues. Raman Suri, consultant, provided research assistance.

In undertaking the study close co-operation was maintained with the Government of Indonesia. The Directorate General of Machinery and Basic Metals Industry of the Department of Industry served as the focal point, while a Government Counterpart Co-ordinating Committee provided valuable assistance to the UNIDO team.

A preliminary draft was discussed at a seminar organized by the Department of Industry in Jakarta at the end of May 1984. This report takes into account the comments made by representatives of the Department of Industry and other Government departments during the seminar.

The presentation of the study comprises three volumes. In Volume I. - Main Report - a summary is presented of the whole study as well as analyses of objectives, constraints and policies. Volume II contains detailed analyses of past trends and future prospects of industrial development in Indonesia. In volume III detailed analyses are made of potentials for development of a selected capital goods industry based inter alia on a survey of the capital goods industry, long-term demand projections and international experience in capital goods production.

Volume I. Main Report

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EXPLANATORY NOTE

The following abbreviation have been used:

ASEAN	Association of South-east Asian Nations
BPPT	Agency for the Assessment and Application of Technology
CACM	Central American Common Market
GDP	Gross Domestic Product
GEC	General Engineering Contractor
ISIC	International Standard Industrial Classification of all Economic Activities
ITB	Institute of Technology Bandung
LAFTA	Latin American Free Trade Area
LNG	Liquified Natural Gas
mbd	Million Barrels Per Day
MDF	Medium-density Fibre Board
MIDC	Metal Industry Development Centre
MTI	Material Testing Institute
MVA	Manufacturing Value Added
NDIM	Newly Developed Innovative Machines
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
PUSPIPTEK	Centre for Development Research, Science and Technology
R & D	Research and Development
SITC	Standard International Trade Classification
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization

ABSTRACT

After a decade and a half since 1968 of very rapid and sustained economic development in Indonesia, assisted by the two oil booms of 1973/74 and 1979/80, but also involving remarkable growth of food production and rapid development of the manufacturing sector, the Indonesian economy now faces leaner years as a result of the turnaround in the world oil market and slower growth prospects in the OECD countries. In order to keep external borrowing and debt within acceptable limits, it will be essential to promote non-oil exports and, where it can be achieved reasonably economically, further import substitution. At the same time, the pattern of economic development must give high priority to the generation of productive employment opportunities. For both these reasons, Indonesia's economic future depends crucially on an appropriate and efficient pattern of industrial development.

Although officially designated a "lower middle income country", Indonesia remains industrially relatively underdeveloped, with one of the smallest industrial sectors among large developing countries. In the more favourable environment established by the economic policies of the Government after 1966, manufacturing grew rapidly from that small base, with an increasingly diversified industrial structure. But much of this growth was concentrated in relatively capital-intensive production of intermediate products and therefore generated relatively little employment directly. It also remained almost wholly domestic market oriented, relying largely on import substitution in a protected market. The bulk of the statistically recorded employment in manufacturing remained in the small-scale and cottage sector.

The central dilemmas of Indonesian economic development in the next decade can be illustrated by two sets of figures. First, in the 1970s, an 8 per cent annual growth rate of GDP was associated with a growth of employment of only 3 per cent, indicating an employment elasticity of only 0.37. If this holds in conjunction with the lower GDP growth rate of 5 per cent officially projected for Repelita IV, employment would grow by only 1.9 per cent per annum, well short of the 2.6 per cent projected growth of the labour force. If a significantly higher growth rate cannot realistically be expected, it becomes extremely important for employment reasons to give growth a more labour-intensive pattern. Secondly, experience of selected developing

countries suggests an elasticity of manufacturing output with respect to GDP of 1.5, while Indonesian experience 1975-80 suggests an income elasticity of demand for manufactures of 1.3. If these relationships hold through the 1980s, output of manufactures will grow at 7.5 per cent, while domestic demand will grow at only 6.5 per cent. To ensure sufficient demand to absorb the growing output of manufactures, it will be necessary either to push import substitution further and/or to give manufacturing a strong export orientation.

Since, given Indonesia's comparative advantage, export industries tend to be labour-intensive, emphasis on the export-oriented strategy is preferable for employment reasons. An econometric exercise, contrasting the effects of an import-substitution and an export-oriented industrial strategy, shows not only, as might be expected, that the latter generates more employment with much smaller capital requirements, but also, surprisingly, lower import requirements and therefore a more favourable balance of payments outcome. To some extent, it should be possible to mix elements of both strategies. A larger employment effect and contribution to net foreign exchange earnings can be expected from emphasis on labour intensive and export industries. But certain capital-intensive industries may provide a more balanced industrial structure, a stronger base for long-term development and a broader technological base. The large size of the country may justify the establishment of some large-scale industries dependent on economies of scale that would not be viable in a small country.

The Indonesian manufacturing sector, as in most developing countries in the early stages of industrialisation, still produces mainly consumer goods (including some consumer durables) and intermediate goods, with only minimal development of an engineering sector producing capital goods. During the 1970s engineering production expanded rapidly, but by 1980 the share of capital goods in total manufacturing output still accounted for only about 5 per cent. Transport equipment, electrical machinery and metal products predominated, while non-electrical machinery lagged behind. One of the issues for industrial policy during Repelita IV and V is whether, and in what ways, to expand this sector. It is to this issue that the rest of this report is addressed.

There are several approaches to assess the future prospects for capital goods. It is natural to try to begin such an investigation by attempting to

forecast future demand for capital goods in the Indonesian economy. Forecasting future demand for capital goods, however, is particularly complex, since it involves estimating highly uncertain variables, including future growth of demand for finished goods, which is the primary determinant of net investment requirements; replacement demand of existing capital stock; and in an open economy, what part of demand will be met by imports and what addition to domestic demand will be made by exports. Yet an econometric exercise has been undertaken to derive estimates of demand for capital goods in major categories in the years 1985, 1990 and 2000, on "high" and "low" trend scenarios (varying mainly with the price of oil) and "off-trend" scenarios which take into account goals established by Indonesian planners. The absolute totals (e.g. that total demand for engineering products will reach US$ 17-18 billion in 1980 dollars by 1990) (trend forecast) are substantial and some interesting results emerge in relation to differential growth rates, sensitivity to "high" and "low" projections and growth paths over time for different categories of capital goods.

Another potential guide to policy-making for Indonesia is the accumulated experience of other developing countries in the development of capital goods industries. Available data show that production of capital goods in developing countries is highly concentrated: seven countries account for almost 90 per cent of the gross output of 46 developing countries. These seven meet about 60 per cent of their requirements from domestic production and have substantial, though widely varying, export ratios. In Brazil, capital goods already account for 29 per cent of exports of manufactures, as compared with only 19 per cent in the Republic of Korea. Brazil had the advantage of a long period of engineering industry development, but the Republic of Korea has been rapidly catching up from a starting point of export-oriented development concentrated initially on consumer goods. Brazil's experience is particularly interesting because of the role played by transnational corporations: both for the access they provide to advanced technology, management and export markets; and for the challenge of dovetailing their operations with national goals and policies. A feature of special interest in the Korean experience is the 1979 scheme to facilitate the development of industrial technology for capital goods production through the designation of certain capital goods as "Newly Developed Innovative Machines" and the offer of special inducements for their production and purchase.

Experience in developing countries at the micro or plant level points to the importance of distinguishing between "task" productivity and "plant" productivity. The former, which reflects chiefly the quality of work of the individual operative tends to be quite high. Low productivity, relative to advanced industrial countries, is mainly accounted for by low "plant" productivity - due mainly to poor plant layout and scheduling, low capacity utilisation, poor production and materials management and inadequacies of design and quality control.

The development of a capital goods industry in Indonesia is needed to diversify the industrial structure and to provide a stronger base for long-term development and technological progress with resulting benefits for employment, skills, exports, etc. In developing a larger capital goods manufacturing sector, there is an obvious case for focusing first on equipment for Indonesia's agricultural and forestry processing industries. The great advantage in selecting such processing equipment, in preference to other engineering industries, is that a substantial domestic market exists. Moreover, the production of most such equipment (though not all) is relatively uncomplicated, with no very high requirements in terms of skills, capital and technology. Here, as in all areas of import substitution, efforts are required to ensure that domestic production will be an economic proposition. If a new domestic equipment-producing industry (e.g. producing rice mills or crumb rubber plants) is seriously uncompetitive with imports in terms of price and/or quality, the effects on the raw material (rice or rubber) producing industries may be negative. Conversely, if the new industry is able to adapt equipment knowledgeably to the special requirements of the domestic raw materials and the tastes and needs of (foreign and domestic) markets, it may largely benefit the agricultural sector.

Adequate assessment of the potential for future domestic production of equipment for these industries requires detailed knowledge of current technology and expert assessment of technological trends. In an effort to make the best possible judgements, this part of the study draws upon the expertise of international equipment producers. The most serious difficulty has proved to be the inavailability of much of the economic data needed to assess whether domestic production of the many hundreds of items of equipment would not merely be technically feasible in Indonesia but would also be

economically feasible, in the sense of not requiring very high rates of effective protection. All recommendations for the establishment or expansion of equipment producing industries in this report should therefore be regarded as provisional, subject to confirmation by detailed studies of economic, as contrasted with merely technical, feasibility.

The estimates of technically feasible local production of equipment for the selected industries yield a list of "most promising candidates" and some very tentative broad aggregates of investment, production and employment. Among the former are selected items of processing equipment in palm and coconut oil extraction plants, coffee and tea processing, wood processing and textile and cement industries. In many cases, the approach already adopted in the sugar industry of appointing a general engineering contractor, preferably a joint venture between an international equipment producer and a domestic company, which sub-contracts production of equipment with gradually increasing local content, has been recommended for several other industries. The tentative aggregate investment requirements during Repelita IV for seven processing industries (excluding textiles) are put at US$ 1,086 million a year; technically feasible local production of processing euipment at US$ 510-600 a year; investment required in additional capacity for processing equipment production at US$ 380-410 million; and direct employment generation in equipment production at 21,000-24,000 jobs.

The report concludes with a review of objectives and constraints and some policy recommendations. Among the latter, besides certain general considerations relevant to industrial policy, particular stress is laid on the desirability of promoting sub-contracting, both as a means of using and encouraging the capacity of small firms and of standardising components required by several industries in order to reap economies of scale; the urgent need to improve quality control; the importance of education and training of the work force and of developing an indigenous capacity in technological research and development; the value of industry associations to operate not merely as lobbyists but as promoters of technical and managerial capability among their members; and, finally, the benefits to be obtained, in the context of an export-oriented industrialisation strategy, of examining potential export markets, e.g. under ASEAN complementation arrangements, for any processing equipment to be produced domestically.

UNIDO could assist Indonesia in the design and execution of policy measures which have been recommended, such as technical assistance in the "general engineering contractor" approach, in technical and economic feasibility studies which are a necessary follow-up to this report, and more generally, in programmes for technology transfer, feasibility studies, management, training, investment promotion, planning and development of engineering capability. UNIDO could also assist in a review of overall industrial prospects and analyses of selected issues of industrial strategy and policy, which may be desirable some time through Repelita IV.

Volume I. Main Report[1/]

Chapter I. Industrial Development in Indonesia: Past Trends and Future Prospects

1.1 Recent Economic Development in Indonesia

The decade and a half since 1968 have been a period of rapid and sustained economic development in Indonesia such as few would have thought likely or possible in the 1950s or early 1960s. Following the change of regime in 1966, the country's tremendous economic problems were energetically tackled. Beginning with measures of stabilisation and rehabilitation, economic policy makers from 1969 on aimed at resumption of long-term economic development. The first Five Year Plan (1969-74) gave top priority to agriculture and especially rice production. The following two Plans shifted the emphasis towards broader economic, industrial and social development.

Indonesia was fortunate in two respects. First, the policy emphasis on rice production coincided with the "green revolution" in rice, the development of high-yielding and fast-maturing varieties. Taking advantage of this opportunity, a wide-ranging programme of "rice intensification", including fertiliser, irrigation, pesticides, rural credit and extension, contributed to an annual rate of growth of rice production averaging 5 per cent over 13 years (1968-81). This not only raised living standards directly but also contributed to general economic development by widening the market for manufactures and services and generating employment opportunities.

Secondly, the two OPEC oil price increases of 1973-74 and 1979-80 for a decade freed Indonesia from the balance of payments difficulties which had constrained her economic development during the 1950s and 1960s. Very large oil earnings, in foreign exchange and (in the form of oil company tax) government revenue, suddenly became available to finance economic and social

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1/ The statistical data and qualitative information included in the report are in the main those available to the UNIDO field mission to Indonesia in October-November 1983.

development projects, both directly and by enhancing Indonesia's international credit standing. The two oil booms were not an unalloyed blessing. They led to some imprudent developments, of which the Pertamina crisis of 1975 was the most conspicuous example, and by raising the real effective exchange rate put severe pressure on the country's non-oil traded goods industries. While manufacturing industries producing for the domestic market derived some compensating benefit from rising domestic demand and from tariff and other protection, non-oil exporters, both of cash crops and manufactures, bore the brunt. The two devaluations of the rupiah, in November 1978 and March 1983, were partially intended to give relief to these industries.

The overall performance of the Indonesian economy during the 1970s is illustrated by Table I.1. The average GDP growth rate of 8 per cent compared well even with the other fast-growing countries of east Asia. The inflation rate fluctuated with the two oil booms but was kept within tolerable bounds by prudent macroeconomic policies. The rise in the investment ratio from 9 to 21 per cent, and of the tax ratio from 8 to 24 per cent, during the period 1968-81, serves to indicate the notable economic development that has taken place. But much of this development, especially of the rapidly growing modern manufacturing sector, has been relatively capital intensive. It has therefore contributed relatively little to the enormous task of providing productive employment for a largely underemployed work force growing by nearly 2 million new entrants a year.

In the past two years, adverse trends in the world economy - the prolonged recession in the OECD countries and the turnaround in the world oil market - have seriously worsened Indonesia's short and medium term economic prospects. For some time, there had been concern about Indonesia's capacity to maintain the volume of oil exports because of rapid growth of domestic demand for oil products at subsidised prices. The decline in the real price of crude oil in world markets which began in 1981 has greatly aggravated the problem. A balance of payments surplus of US $ 2 billion in 1980-81 turned into a deficit of nearly US $ 3 billion in 1981-82 and nearly US $ 7 billion in 1982-83, and there was a sharp fall in oil tax revenue.

The past year has brought a considerably better economic performance than had been expected. Real economic growth in 1983 is estimated to have reached at least 4 per cent and the balance of payments position improved

Table I.1 Indicators of economic performance, Indonesia, 1968-81

(Percentage)

Year	GDP Growth Rate	Inflation Rate	Growth of Output				Investment	Tax
			Rice	Food	Agriculture	Crude Oil	GDP Ratio	GDP Ratio
1968	13.9	85	12.5	9.1	6.9	18.0	9	8
1969	9.0	10	5.1	1.0	1.1	23.3	12	9
1970	10.9	9	6.5	3.5	4.2	15.1	14	10
1971	6.5	2	4.7	3.4	4.0	4.3	15	11
1972	9.4	27	-3.6	1.1	2.1	21.3	19	13
1973	6.8	27	10.6	7.0	3.7	23.8	18	15
1974	7.6	33	4.7	6.9	3.7	2.8	17	16
1975	5.0	20	-0.6	0.9	0.0	-5.0	20	18
1976	6.9	14	3.9	3.5	4.7	15.3	21	19
1977	8.8	11	0.1	-1.2	1.6	11.7	20	19
1978	6.8	8	10.1	9.6	7.2	-2.9	21	19
1979	5.3	20	2.3	4.0	3.8	-2.6	21	21
1980	9.6	16	12.8	8.6	5.2	-1.1	22	24
1981	7.6	7	10.4	8.1	3.5	1.6	21	24
Annual Average 1968/81	8.2	20.1	5.1	4.0	3.4	7.8		

Source: Central Statistical Bureau.

dramatically, from an overall deficit of $ 40 million in 1982/83 to an estimated surplus for US$ 2 billion in 1983/84. Exports have also performed well, with oil production rising from 1.4 mbd towards 1.6 mbd and some of the major non-oil exports, especially palm oil, textiles, plywood and handicrafts registering increases of 40-50 per cent.

All these improvements reflect well on the quality of macroeconomic management in a critical situation. The government has taken prompt action to deal with the immediate crisis. Public sector wages and salaries have been frozen, public investment projects drastically pruned, oil and food price subsidies cut, the rupiah devalued (thus offsetting the fall in oil tax revenue and giving price incentives to non-oil export industries), the banking system partially deregulated and a tax reform prepared to stimulate domestic resource mobilisation. But Indonesia clearly faces leaner years. There is little reason to believe that world oil prices will rise in real terms before the end of the 1980s, and while LNG exports will help fill the gap, exportable surpluses of oil will inevitably decline and may disappear by the end of the

century. The fourth Five Year Plan, commencing on 1 April 1984, envisages annual growth rates of GDP and manufacturing of 5 per cent and 9.5 per cent respectively, a good deal below those achieved during the 1970s; yet even these will strain available external and domestic resources.

In order to keep external borrowing and debt within acceptable limits, it will be essential to promote non-oil exports and, where it can be achieved reasonable economically, further import substitution. At the same time, the pattern of economic development must give high priority to the generation of productive employment opportunities. For both these reasons, Indonesia's economic future depends crucially on an appropriate and efficient pattern of industrial development. The main burden of providing the jobs will inevitably fall on the service sector. But manufacturing can and must make a contribution.

1.2 The Industry Sector: Past Performance

Although officially designated a "lower middle income" country, Indonesia remains industrially relatively underdeveloped. In 1980, the contribution of large and medium manufacturing to GDP was only 10.3 per cent.[1/] Among large developing countries, only Bangladesh and Nigeria had smaller manufacturing sectors. However, Indonesia's manufacturing sector grew rapidly during the 1970s from a small base (only 6.8 per cent of GDP in 1970). In absolute terms of total value added, Indonesia now has a manufacturing sector of considerable size, exceeded among Asian developing countries only by the People's Republic of China, India, the Republic of Korea and the Philippines.

Indonesia is thus an active partner in the world's industrial restructuring process. Internationally Indonesia's share of world manufacturing value added more doubled from 0.10 per cent in 1970 to 0.22 per cent in 1980. In other terms Indonesia's share of total value added of all developing countries increased from 1.18 per cent in 1970 to 2.0 per cent in 1980.

1/ Unless otherwise indicated, manufacturing refers to the modern organised sector of large and medium-scale enterprise with more than 20 employees.

The new industrial policies adopted by the Soeharto Government after 1966 dramatically improved the climate for industrial growth, by liberalising foreign exchange and trade and by encouraging domestic and foreign private investment, while the oil booms provided resources for massive public sector investment. As a result, manufacturing showed the highest rate of growth, next to construction, among the major sectors of the economy during the 1970s, a rate (12.3 per cent) exceeded only by few developing countries (Table I.2). In the latter half of the decade, growth slowed down somewhat, as the oil boom reduced the international competitiveness of non-oil traded goods production and as the easy stage of import substitution was gradually coming to an end.

The high rate of industrial growth during the 1970s greatly diversified the structure of the Indonesian manufacturing sector. Some of the larger traditional branches, food processing, textiles, beverages and tobacco, grew more slowly, while others grew from nothing or very small beginnings, among them iron and steel, cement, rubber and engineering industries. Medium growth

Table I.2: Indonesia's average annual rate of growth of GDP and various sectors 1960-1980
(based on constant 1975 prices in US $)

	1960-65	1965-70	1970-75	1975-80	1960-70	1970-80	1960-80
Agriculture	1.1	2.8	3.5	4.3	2.0	3.9	2.9
Mining and quarrying	1.8	11.3	9.5	5.0	6.4	7.3	6.9
Manufacturing	1.5	7.3	14.2	10.6	4.4	12.3	8.3
Utilities	8.8	12.8	12.7	11.5	10.8	12.1	11.5
Construction	-1.6	14.4	20.5	11.4	6.1	15.9	10.9
Services	2.8	5.3	9.8	9.6	4.0	9.7	6.8
Gross domestic product	1.7	5.6	8.2	7.4	3.6	7.8	5.7

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office with estimates by the UNIDO secretariat.

rates were recorded by industrial chemicals (chiefly urea), saw-milling, glass and paper products (Table I.3). Many of these fast growing industries were relatively capital intensive. This also applied to large projects in the petroleum sector, such as oil refineries and LNG plants, which are not included in these statistics. Divergent rates of growth among branches brought substantial changes in the composition of the manufacturing sector,

with a marked decline in the relative importance of food processing and textiles in favour of chemical, wood and metal working industries. One feature of this structural change was a substantial shift from single-use consumer goods towards consumer durables, capital goods and intermediate products.

A striking characteristic of Indonesia's industrial development so far has been its almost complete orientation to the domestic market. Despite efforts to encourage exports of labour-intensive manufactures which showed some results in 1978-79 and again in 1982-83 in increased exports of garments, electronic products and recently plywood, manufactured products (i.e. containing substantial value added by manufacturing) accounted in 1980 for only about 2 per cent of total Indonesian exports. Industrial growth has met expanding domestic demand and replaced imports. Import substitution has in the past decade considerably reduced the share of imports in the Indonesian market of urea and paper and has virtually eliminated imports of wheat flour, cotton yarn and fabrics, caustic soda and insecticides. Indonesia is almost self-sufficient in most food products (sugar and temporarily still rice being the most important exceptions), in textiles and oil products. But she continues to rely on imports for most chemical and metallic intermediate products, including components for assembly, and for most producer capital goods. Domestic production of the latter is limited, though expanding.

While value added in large and medium-scale manufacturing grew during the 1970s at an average annual rate of over 12 per cent, employment rose by only 7 per cent a year, from 487,000 in 1970 to 963,000 in 1980. The difference reflects a significant growth in labour productivity, but it also indicates the failure of manufacturing growth to have much of a direct effect on Indonesia's employment problem. The increase in the number of jobs created in large and medium-scale manufacturing of 0.5 million during the decade represents only one-fifth of the average annual increase in Indonesia's labour force during the period. Indirectly, of course, through the stimulus it has given to transport and other service industries, industrial growth has undoubtedly generated additional employment opportunities.

Growth of labour productivity has been very high in some of the very capital intensive branches of industry, such as cement, non-electrical machinery, fabricated metals and industrial chemicals, and was likely to be

Table I.3: Manufacturing value added by branch of industry ranked according to average annual growth 1971-1980 (based on values in 1975 US $ constant prices)

ISIC		Average annual growth rate
		Percentage
	- High growth -	
3710	Iron and steel	50.2
3560	Plastic products	33.2[a/]
3230	Leather products	31.5[a/]
3830	Machinery electric	30.8
3690	Other non-metallic mineral products	28.7
3820	Machinery, except electrical	27.6[a/]
3420	Printing and publishing	24.3[a/]
3550	Rubber products	22.8
3810	Fabricated metal products	20.2
	- Medium growth -	
3510	Industrial chemcials	18.9
3320	Furniture, except metal	18.7[a/]
3310	Wood products, except furniture	17.6
3620	Glass and products	17.4
3410	Paper and paper products	16.1
3110	Food products	14.1
3220	Wearing apparel, except footwear	12.6[a/]
3850	Professional and scientific equipment	12.0[a/]
3900	Other manufactured products	12.0[a/]
3210	Textiles	11.8
	-Low growth -	
3240	Footwear, except rubber or plastic	10.1
3130	Beverages	9.7
3140	Tobacco	9.4
3530	Petroleum refineries	8.0
3840	Transport equipment	5.6
3520	Other chemcials	3.2
Total manufacturing		11.8

Source: UNIDO Data Base, information supplied by the United Nations Statistical Office, with estimates by the UNIDO secretariat.

a/ 1971-76.

even higher in the large capital intensive developments planned in the late 1970s, in petroleum refining, LNG trains, iron and steel, and non-ferrous metal smelting. The latter industries, as might be expected, also show the highest levels of labour productivity, while labour productivity remains very low in the more labour intensive industries, such as textiles and garments, furniture, potteries and metal fabrication.

The latest available statistics on the geographical distribution of Indonesian manufacturing, those from the 1974-75 Census of Industry, show that Java then accounted for 85 per cent of all medium and large-scale enterprises and 83 per cent of value added. Sumatra had another 12 per cent of value added, leaving only 5 per cent for all the rest of the country. Since then industrial development based on the oil, natural gas, timber and other natural resources of the outer islands may have shifted the distribution in terms of value added (though hardly of employment) somewhat in their favour. But it remains true that Java is much more industrialised than the other regions, primarily owing to better transport and other infrastructure, government and services, although concentration of industry in turn promotes concentration of infrastructure investment and service industries. Government policies aim at promoting industrial development in the outer islands. Four major industrial growth regions outside Java have been identified and industrial estates are being developed in some of them.

Since the passing of the Foreign Investment Law of 1967, there has been a good deal of foreign investment in Indonesian manufacturing, with Japanese capital in the lead. Taking the large and medium-scale manufacturing sector as a whole, private domestic enterprises still dominate ownership, accounting (in 1974-75) for almost one-half of value added. But they were heavily concentrated in the traditional medium-sized industries. In the past decade the relative importance of state enterprises, multinationals and joint ventures has increased considerably, especially in the large-scale heavy industry sector.

Besides the large and medium-scale manufacturing sector with which this report is mainly concerned, there remains a huge and diffuse sector of small-scale and household or cottage industry. While it accounts for little more than one-fifth of value added in manufacturing, it is overwhelmingly more important in terms of employment. According to the official statistics (which have many weaknesses), small-scale and household-cottage industry accounted together for 87 per cent of total manufacturing employment in 1974-75 and for 80 per cent in 1979 (the apparent decline being largely accounted for by change of statistical coverage, in particular exclusion of all but regular workers). A large proportion of workers in household industry are family workers working part-time and intermittently.

The extreme heterogenity of manufacturing industry in Indonesia - one can almost speak of dualism - poses a dilemma for policy makers. Employment and anti-poverty objectives suggest the allocation of considerable effort and resources to the household sector, while growth objectives are more likely to be served by concentrating on the larger firms in the modern sectors. Even in relation to production of capital goods, the small-scale and household-cottage sector is not entirely negligible. There is significant production of metal products, such as hand tools and small agricultural machines, as well as vehicle components and repair, which needs to be borne in mind in any policy consideration of the capital goods sector.

1.3 The Industry Sector: Prospects

1.3.1 Demand for Manufactured Products.

Demand for the products of Indonesia's manufacturing sector is determined by three factors. One is the size and composition of total domestic demand for manufactures. The second is the relative share of imports in the domestic market for manufactures. The third is the size and composition of manufactured exports. The second and third of these will depend on the development of the comparative advantage enjoyed by Indonesian manufacturing industries relative to their foreign competitors. The prospects for the Indonesian manufacturing sector over the next decade are conveniently examined by considering first the growth prospects for the manufacturing sector as a whole and then prospective changes in comparative advantage and in the composition of domestic demand for manufactures.

The fourth Five-year Plan assumes annual rates of growth of GDP and manufacturing of 5 per cent and 9.5 per cent respectively. Two questions may be asked about the implications of such a growth rate for the manufacturing sector. First, will such a rate of growth of GDP be sufficient to absorb the growth in Indonesia's labour force? Secondly, will domestic demand grow at a rate sufficient to absorb the output generated by the rate of growth of the manufacturing sector implied in such an overall growth rate?

During the period 1971-80 manufacturing employment and output grew at an annual rate of 5.3 and 14.9 per cent, as compared with 3.0 and 8.1 per cent for the economy as a whole. These figures imply an employment elasticity with respect to output growth of 0.36 for manufacturing and 0.37 for the whole economy. During the 1980s the labour force, assuming an unchanged participation rate, is expected to grow at an annual rate of 2.6 per cent. A 5 per cent rate of growth of GDP, with an unchanged employment elasticity of 0.37, would yield an increase in employment at an annual rate of only 1.9 per cent. To meet the minimum target growth rate of employment of 2.6 would require either a growth rate of GDP of 7 per cent or an increase in the employment elasticity to 0.52 per cent. Some increase might result in any case from a decline in the relative importance of the oil sector. The elasticity could be further raised by policies to encourage labour-intensive manufacturing, including small-scale industry.

Experience of other developing countries at Indonesia's present stage of development suggests an elasticity of manufacturing output growth with respect to GDP growth of 1.5 per cent, and there are reasons to believe that some such relationship will hold for Indonesia in the 1980s. In other words, for GDP to grow at 5 per cent, manufacturing output must grow at 7.5 per cent. However, between 1975 and 1980, while GDP grew at an annual rate of 7.5 per cent, domestic demand for manufacturing grew at 10 per cent, giving an income elasticity of demand for manufacturing of only about 1.3. If this value holds during the 1980s, a growth rate of GDP of 5 per cent would yield a rate of growth of the domestic market of only 6.5 per cent, not enough to absorb the hypothesised output growth of 7.5 per cent. To ensure an adequate growth of demand, the gap must be filled either by further import substitution or by a sufficiently high rate of growth of exports of manufactures. For employment reasons, an export oriented strategy is likely to be preferable.

For the purpose of projecting prospects and indicating policy options during the 1980s for the manufaturing sector in general and the capital goods industries in particular, an intermediate assumption of a growth rate of GDP of 6 per cent has been made in this study. Given the same elasticity of manufacturing output growth (1.5 per cent), this would imply an annual growth rate of manufacturing output of 9 per cent. To absorb this output, given an income elasticity of demand for manufactures of only 1.3, even more emphasis

on import substitution and/or export promotion will be needed. On the other hand, the more ambitious GDP growth rate target would, with an unchanged employment elasticity of 0.37, get closer (2.2 per cent) to the projected growth rate of the labour force of 2.6 per cent.

To make reliable projections of any country's future comparative advantage at a disaggregated level is hardly possible. But it may be helpful in assessing the likely trends in the pattern of Indonesia's future comparative advantage in manufacturing to draw on the experience of other developing countries.

The first generation, after Japan, of the newly industrializing countries of east Asia (NICs) which achieved spectacular growth of exports of labour-intensive manufactures in the 1960s and early 1970s have since around 1975 embarked on a transition from labour to capital and skill intensive products. Their success in this strategy will be relevant to Indonesia because it will influence the extent to which markets for labour intensive products will be vacated. But in seeking export markets for such products, Indonesia may encounter formidable competition from a new generation of industrialising countries, such as the People's Republic of China and the countries of south Asia.

Four sets of data on the manufacturing exports performance of developing countries may help throw further light on the characteristics of manufacturing industries in which Indonesia is most likely to have a comparative advantage.

The first shows that the share of resource-based exports declines with the stage of economic development. The comparative advantage due to high levels of total factor (capital plus labour) productivity which the more highly industrialised countries obtain from their endowment with human capital (skills, management, technology), less developed countries are most likely to derive from endowment with natural resources. Indonesia is still clearly in the latter category.

The second set of data compares levels of wages and labour productivity in selected industries in Malaysia, the Philippines and Indonesia. It shows that wages levels in Indonesia were very much lower than in Malaysia and only

two-fifths even of those in the Philippines. But the potential comparative advantage which Indonesian manufacturers might have enjoyed on account of low wages was largely offset, and in some industries outweighed, by low levels of labour productivity. While lower capital intensity of production may explain some of the differences in labour productivity, the most likely explanation is found in other factors, such as lower average levels of skill, management and organisation of production for which the regulatory environment may be partially responsible.

The third set of data examines the relative success of developing countries in increasing their share of imports of various manufactures into the USA and other developed countries. While miscellaneous manufactures (SITC 8), among others, have done well, manufactured goods (SITC 6) and machinery and transport equipment (SITC 7) have tended to do badly.

Finally, data from a UNIDO study of 134 manufacturing industries from three country samples during the years 1966-75 have been classified according to the product characteristics of non-resource-based industries. The classification rests on the hypothesis that comparative advantage in exports of manufactures depends, apart from differences in factor proportions, chiefly on skill requirements and on the degree to which the production process is standardised (in the sense that developed countries are more likely to have a comparative advantage in products requiring quick adaptation in response to changes in demand). The data indicate a range of non-resource-based manufactures in which Indonesia is most likely to have a comparative advantage because of relatively high labour intensity, relatively low skill requirements and a relatively high degree of standardization.

Domestic demand for manufactures is primarily influenced by population growth and by changes in income. A UNIDO report[1/] identifies growth elasticities (with respect to per capita GDP) and size elasticities (with respect to population) of value added per capita for 3-digit ISIC industries from cross section data for large countries, including developed and developing. They suggest that increases in market size have little effect on

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1/ UNIDO: Industry in a Changing World, (United Nations publication, sales No. E.83.II.B.6).

production in most cases. Branches for which market size matters because large production runs and economies of scale are important include machinery, professional equipment, iron and steel and chemicals. Other things being equal, these are industry branches in which Indonesia, because of the large size of its domestic market, might have a certain advantage as compared with small countries at a similar stage of development. The highest growth elasticities, as might be expected, occur in the more capital intensive industries producing intermediate products and capital goods.

1.3.2. Priorities in Industrial Strategy.

Since 1969, there have been significant changes in objectives of industrial development included in Indonesia's Five-year Plans (Repelita), from emphasis on industries ancillary to agriculture in Repelita I to emphasis on social objectives (especially employment and protection of pribumi entrepreneurs) in Repelita II, and broad-based industrial development on the basis of domestic oil, mineral, timber and other natural resources, as well as of labour intensive manufactures for export, in Repelita III. For the fourth Plan (Repelita IV), it is envisaged that manufacturing should take the place of the oil sector as the main engine of growth, contributing an increasing proportion of value added, net foreign exchange earnings and employment. Promotion of machinery and export industries is to receive high priority, but there are also plans for further import substitution, especially in the processing of raw materials into intermediate products for downstream manufactures.

In Repelita IV the overall economy (GDP) and manufacturing are expected to grow at 5 and 9.5 per cent annually respectively. The Plan envisages a real growth rate manufactured exports of 13-14 per cent annually. In terms of employment the Plan estimates that the manufacturing sector will provide new employment opportunities for 1.2 million persons. Repelita IV attaches high priority to the development of the basic chemical industry as well as metal and machinery industries, which both are expected to grow at around 17 per cent per year. Miscellaneous industry consisting mainly of basic commodities is planned to expand at 6.5 per cent while growth of small-scale industry is slated at 3 per cent.

In view of the important role of small-scale industry in Indonesia in creating employment, and its prevalence in rural areas and regional dispersion, strategies of industrial development should include assistance to this sector in overcoming its many problems - low productivity, intermittent employment, financing, marketing, quality control, managerial and others.

The options open to Indonesian policy makers concerned with industrial development can usefully be examined in an analytical framework of two alternative broad strategies. The first aims to reduce Indonesia's dependence on world markets and imports. It emphasizes the development of manufacturing industries producing for the domestic market for consumer goods, capital goods and intermediate products. In so far as it relies heavily on import substitution, it may be called an inward-looking strategy, or alternatively one of self-reliance. The second strategy focuses on the development of industries in which Indonesia can be expected to have a comparative advantage in international trade. It tends to emphasize labour intensive industries, export promotion and small-scale enterprise. It can be called an outward-looking or labour intensive strategy.

Growth prospects for different industries can be projected for the first strategy on the basis of a continuation of the historical pattern in Indonesia and the experience of another large country which adopted such a strategy, Brazil in the 1960s. In the specification of growth elasticities for the second strategy, the experience of export-oriented industrializing countries, such as the Republic of Korea (in the late 1960s and early 1970s) and Malaysia is a useful guide.

In assessing the economic effects of industrial development under the two alternative strategies, it is important to take into account not only the direct effects on value added and employment in each industry, but also the indirect effects on output and employment in industries using that industry's products (forward linkages) and industries supplying inputs to that industry (backward linkages), as shown by input-output relationships. Forward linkages imply an assured market. Backward linkages imply that growth of the industry may give a stimulus to supplier industries. But large linkages present only a <u>prima facie</u> case for expansion of an industry. While establishment or expansion of an industry may help user and supplier industries if it produces

its products efficiently (i.e. cheaply, quality for quality), it would affect them adversely if it could operate only under cover of high rates of effective protection from imports.

Comparison of the direct and indirect economic effects of industrial development under the two strategies, in terms of labour-output ratios to measure relative labour intensity, and of skilled man-years per unit of output and non-wage value added per worker as proxies for the use of human and physical capital, yields a number of interesting findings which are presented in Table I.4.

As might be expected, because of its emphasis on relatively labour intensive industries, it is the second (export-oriented) strategy which has the more favourable effects on employment, even when the same labour intensities are assumed in each industry under the two strategies. Not surprisingly, the first strategy has much the larger capital requirements also, 30 per cent larger than those of the second strategy. Most striking is the finding that, despite its emphasis on import substitution, the first strategy has the higher import requirements, 36 per cent of the value of production, as compared with 31 per cent for the second strategy.

Table I.4 Summary results strategy A (inward looking strategy) and B (outward looking/labour intensive strategy)

Summary results	Increments 1980-1990	
	Strategy A Inward looking strategy	Strategy B Outward looking strategy
Production (Rp. billion)	22,191	22,191
Employment (thousands of persons)	1,785	2,531
Investment (Rp. billion)	32,688	22,462
Value added (Rp. billion)	6,670	6,535
Imports of inputs (Rp. billion)	7,878	6,903
Incremental ratios:		
Capital-output	1.5	1.0
Capital-value added	4.9	3.4
Efficiency of capital (value added capital)	0.20	0.29
Capital-labour (Rp. million)	18.3	8.9
Value added-labour (Rp. million)	3.7	2.6

Source: Vol. II, Chapter 4.3.

To some extent, it should be possible to mix elements of both strategies. A larger employment effect and contribution to net foreign exchange earnings can be expected from emphasis on labour intensive and export industries. But certain capital intensive industries may provide a more balanced industrial structure, a stronger base for long-term development and technological deepening. The large size of the country may justify the establishment of some large scale industries dependent on economies of scale that would not be viable in a small country. Other things being equal, the case for such an industry or project is stronger if the initial investment can be financed by external capital which would not otherwise be forthcoming. Even here, however, selection needs to be based on sound economic criteria, carefully weighing economic costs and benefits.

A selective approach to import substitution can be blended into a labour-intensive strategy by focusing on industries in which Indonesia is likely to have a comparative advantage in the longer run, thus minimising the need for longer-term protection. The most favourable prospects here are among simple engineering products, especially for processing equiment. The development of labour intensive and resource based industries also has important implications for regional development. While labour intensive industrial development will continue to be concentrated in Java, the processing industries will largely be located in the outer islands where the natural resources are found. In some cases, these may also support economic processing equipment producing industries.

Chapter II. Survey of Capital Goods and Engineering Industries

2.1 An Overview

Capital goods production constitutes an important part of the engineering industry sector classified under ISIC 38 "fabricated metal products, machinery and equipment". The sector includes five main industrial groups: fabricated metal products (ISIC 381); machinery, except electrical (382); electrical machinery (383); transport equipment (384); professional, scientific and photographic equipment (385). The engineering industry includes manufacture of intermediate products, parts and components as well as assembly operations. One of the most heterogeneous branches of manufacturing, the engineering sector produces consumer durables (such as radios, TV sets, motor cars and cycles), intermediate goods (such as steel rods and components for assembly) and capital goods (such as machinery). The distinction between consumer durables and capital goods is not clear-cut since some products, such as sewing machines, are used both by households and industry. But the distinction is important because market conditions and production processes may be very different for products meeting consumer or investment demand.

Indonesian industrial statistics do not permit an exact statistical definition of capital goods. But broad estimates, derived from the provisional 1980 input-output table, indicate the distribution of capital goods, intermediate products and consumer durables production for the major branches of engineering industries (Table II.1). They show that a high proportion of the output of engineering industries (50.3 per cent) consisted of intermediate goods, followed by capital goods (28.2 per cent) and consumer durables (21.5 per cent). This chapter focuses, after an initial survey of the engineering sector as a whole, on those branches which produce most capital goods, i.e. non-electrical machinery and equipment, electrical machinery and metal products. Emphasis will be placed on capital goods for industrial use, and especially plant processing equipment for raw materials from agriculture and forestry. Some information is also provided on the iron and steel sector (ISIC 371) which supplies part of an important raw material for the engineering sector.

Table II.1: Component shares of domestically produced goods, 1980

ISIC		Intermediate output	Private consumption	Government consumption	Gross fixed capital formation	Change in stock	Exports	Total production
381	Metal products	71.59	7.78	2.48	18.53	-1.03	0.66	100.0
382,383	Machinery, repair	39.02	11.67	5.93	19.39	15.36	8.73	100.0
384	Transport equipment	33.92	20.28	7.76	37.19	0.69	0.16	100.0

Source: Provisional Input-output Tables, 1980.

2.2 Overall Performance

The capital goods and engineering sector was one of the fastest growing branches of Indonesian manufacturing industry during the 1970s, admittedly from a small base. Table II.2 shows particularly high growth of value added for the electrical machinery sector (chiefly electronic products). Rapid growth raised the share of engineering goods in total manufacturing value added from 6.1 per cent in 1970 to 16.9 per cent in 1980. Assuming, as Table II.1 suggests, that capital goods accounted for 28.2 per cent of engineering sector output, the share of capital goods in total manufacturing output in 1980 can be put at about 5 per cent. An embryonic capital goods industry has emerged.

Among the major branches of the engineering sector, the transport equipment sector was the largest (6.4 per cent of total manufacturing value added), followed by electrical machinery (5.3 per cent) and metal products (3.5 per cent). The share of non-electrical machinery (1.6 per cent) lagged behind, and production of plant equipment included in this category was still very small.

Because much of it was relatively labour-intensive, the engineering industry made a relatively substantial contribution to employment creation within the manufacturing sector. Employment in large and medium scale engineering industry grew during 1971-80 at an average annual rate of 15.8 per cent. In absolute terms, employment increased by some 93,000, from 28,000 in

Table II.2: Value added, employment and labour productivity in capital goods and engineering industries 1970-1980

ISIC	Average annual growth 1971-1980		Share of value added in total manufacturing		Share of Employment in total manufacturing		Value added per employee 1980 (000 US $)	Contribution to overall employment growth of total manufacturing 1970-80
	MVA	Employment	1971	1980	1970	1980		
381 fabricated metal products	20.2	11.5	2.3	3.5	2.8	4.2	2.9	5.7
382 Machinery, except electrical	19.5	10.5	0.4	1.6	0.9	1.2	4.5	1.6
383 Electrical machinery	30.8	27.1	2.5	5.3	0.7	3.9	4.8	7.1
384 Transport equipment	5.6	16.6	0.9	6.4	1.3	3.1	7.3	5.1
385 Scientific and professional equip.	12.0[a/]	-	0.0	0.1	0.0	0.1	2.2	2.1
ISIC 38 sub-total	17.6	15.8	6.1	16.9	5.8	12.6	4.7	21.6
Total manufac.	11.8	7.1	100.0	100.0	100.0	100.0		100.0

Source: Volume III, Part One, Table II.1.
a/ 1971-1976.

1970 to 121,000 in 1980. In the electrical machinery branch, the rate of growth of employment was 27 per cent per annum.

Around 86 per cent of all large and medium engineering enterprises were (1979) located in Java and most of the rest in northern Sumatra. Average plant size has risen in recent years and is particular large in the electrical machinery branch, with its large-scale assembly operations. But it is noteworthy that, outside the large and medium scale sector, there is substantial production, particularly of metal products (furniture, hand tools, cutlery, screws and bolts, etc.), by small-scale and household enterprises

throughout the country. Their contribution might well be enhanced by sub-contracting arrangements. Non-pribumi private ownership predominates in all engineering industries (reaching 50 per cent in the electrical machinery branch, according to one sample survey), followed by private pribumi enterprises which are relatively most important in the transport equipment sector. Foreign investment in the engineering sector has been quite significant, with some $500 million of realised investment by 1981, chiefly in assembly operations.

In 1980 close to two-fifths of total manufactured imports consisted of imports of machinery and equipment. Exports of engineering products are extremely limited, confined to electronic products worth about $108 million in 1980 or 3.7 per cent of exports of manufactures. The share of imports in apparent domestic consumption of machinery and equipment is very high, estimated at 66 per cent, domestic production acounting for only 34 per cent. Since much of present engineering production consists of assembly operations, import dependence is particularly high for parts and components and other inputs. In 1980 imports accounted for 79 per cent of the raw material and components requirements of the engineering sector (Table II.3). Import dependence was particularly high for batteries, communications equipment, non-electrical machinery, structural metal products and metal containers. But there were also a few products of which domestic production provided more than one-half of all raw material requirements, among them repairs of electrical equipment; cutlery, screws and bolts; bicycle and becak assembly; and shipbuilding and repair.

2.3 Review of Key Capital Goods Industries

The non-electrical machinery branch, although still a relatively small one, is of greatest potential interest in relation to production of capital goods. Among its sub-groups are engines and turbines, agricultural machinery and equipment, metal and wood working machinery and office equipment. The branch has lagged behind the growth of the rest of the engineering sector since 1975, so that its share in value added and employment has declined. The reasons for this can be traced to meagre investment, presumably reflecting problems connected with shortage of skilled labour, management and marketing expertise and technical knowhow. Very few enterprises have the capacity to

Table II.3: Reliance on imported raw materials, ISIC (38) engineering industries, 1980

ISIC		Imported Raw Materials and Components in Percentage of Total Raw Materials
37100	Iron and Steel Basic Industry	
38111	Agriculture, hand tools	60.0
38112	Cutlery, screws, bolts	20.3
38113	Kitchen apparatus	65.6
38120	Metal furniture and fixture	37.6
38130	Structural metal products	86.6
38140	Metal containers	81.9
38190	Metal products n.e.c.	61.4
38200	Machinery and repair	82.6
38311	Storage batteries	96.1
38312	Dry cell batteries	89.7
38320	Radio, TV, communication equip.	87.9
38330	Elec. apparatur/supplies	75.2
38340	Repair of elec. appl.	18.2
38411	Shipbuilding and repair	45.4
38430	Motor vehicles ass./manu.	81.2
38440	Motor cycle/3 wheel veh.	64.7
38450	Bicycle, becak ass./manu.	49.7
38460	Motor vehicle body + equipment	57.5
38490	Transport equip. n.e.c.	59.2
38500	Manufacture of scientific equip.	34.9
38	Metal products, machinery and equipment	76.1

Source: Survey of Industries, BPS, Indonesia, Vol. II, 1980.

manufacture complete products or parts. Castings are generally of poor quality and production is greatly dependent on imported components.

Table II.4 shows the beginnings of an industry producing plant and equipment for agricultural processing, including such items as sugar cane milling, coffee milling, tea processing, corn grinding and rice press machines. Most production processes amount to assembly using imported parts. Machinery used is often old and technology traditional. In contrast to the other major branches, average size of enterprise in this branch is relatively small, with an average (in large and medium size firms) of 99 employees. Ownership is shared in almost equal parts between pribumi and non-pribumi, foreign and government owners. There are virtually no exports. The effective

rate of protection is relatively low (18 per cent). If the rapidly growing demand for non-electrical machinery products in Indonesia is to be met to an increasing extent from domestic production, improvements in product quality, technological capability, competitiveness, management and marketing skills are essential.

The most important sub-sectors of the electrical machinery branch are communications equipment, electrical cables and transformers, lamps, refrigerators and electronic products, such as radios, TV sets, cassette, tapes, etc. Most of these products are consumer durables, but there is also a large number of potential capital goods products. The electrical machinery branch has shown the highest rates of growth of value added and employment, with moderate growth in labour productivity. Production processes, however, are generally quite up to date, consisting mostly of assembly operations which use unskilled or semi-skilled labour. The majority of enterprises are located in and around Jakarta. They are typically large-scale, with an average of 337 employees. Ownership is predominantly non-pribumi, followed by foreign ownership. Electrical machinery is the only branch that has penetrated export markets, some 14 per cent of its output being exported. The main export product is integrated circuits bond-processed by US companies. Inevitably, in view of its predominantly assembly character, the industry's inputs come almost entirely from abroad, only 8 per cent of raw materials and components being obtained from domestic sources. The finished products are highly protected, with an effective rate estimated at 111 per cent.

The fabricated metal products branch produces a wide range of goods, ranging from agricultural hand tools and equipment, kitchen utensils and furniture, metal containers, screws and bolts, to galvanised products. The branch accounted in 1981 for about 4 per cent of manufacturing employment (44,000 persons). Labour productivity during the 1970s grew almost as rapidly as employment, but its level was still very low in all sub-sections. A significant proportion of employment and output of metal products in Indonesia is still in small-scale and household enterprises spread throughout the major islands. There are virtually no exports and a large proportion of inputs of intermediate products is imported, but there are exceptions, such as cutlery, screws and bolts production where domestic raw materials predominate, and inputs of chemicals (chiefly paints) of which about half are of domestic

Table II.4: Domestic production and repair of non-electric machinery and equipment (ISIC 382) in Indonesia, 1980

Machinery	Unit	Physical Production or Repair	Value (000 Rp.)	Unit Value (000 Rp.)
Generator	unit	58,705	26,369,491	449.2
Radiator	000 units	130	4,231,169	32.6
Stone crusher	ton	102	1,300,500	12,750.0
Generator sets	set	1,645	962,549	585.1
Cranes	unit	37	673,719	18,208.6
Tile press	set	2,578	207,540	80.5
Tile roofing machines	set	206	181,902	883.0
Rice press machines	set	451	175,891	390.0
Tile press machines	set	250	153,000	612.0
Tea processing machines	unit	27	142,598	5,281.4
Mixing machinery	set	37	77,000	2,081.1
Rubber machinery	ton	27	60,937	2,256.9
Sugar cane milling machines	ton	241	58,319	242.0
Brick processing machines	number	1,002	47,600	47.5
Weaving machine apparatus	number	5,205	45,018	8.6
Rubber rollers machines	number	33	35,600	1,078.8
Sondir/special machines	number	24	28,800	1,200.0
Corn grinder mill	number	142	22,120	155.8
Coconut oil milling machines	number	40	21,000	525.0
Brick pressing machine	number	3	17,000	5,666.7
Maize press/roller machines	set	134	16,623	121.8
Tapioca milling machines	set	2	15,000	7,500.0
Moulding machines	number	75	11,250	150.0
Kloss machines	number	15	11,250	750.0
Finishing textile machinery	unit	12	11,100	925.0
Saw machines	unit	1	9,000	9,000.0
Coffee milling	number	33	8,500	257.6
Excenter press machines	number	13	1,500	115.4
Bean curd processing machines	number	7	980	140.0
Chili processing machines	number	2	270	135.0
Other machines	-	-	18,429	-
Total all machines	-	-	34,915,661	-

Source: Survey of Manufacturing Industries, Indonesia, Vol.II, 1980.

origin. Production processes are very diverse, ranging from old factories with outdated technology and low quality products to modern plants. Average capital intensity is low.

2.4 Development Plans

Repelita IV accords the engineering industry high priority, with a planned growth rate of 17.0 per cent for metal and machinery which is substantially higher than the 9.5 per cent envisaged for manufacturing as a whole. Special attention will be directed at industries producing industrial machinery, in the hope that Indonesia will increasingly be able to meet its own needs. High priority is accorded to agricultural and processing machinery industries. It is this that lends importance to Volume III of the present study aimed at identifying opportunities for domestic production of capital goods required for processing of agricultural and forestry products.

During Repelita III, some 52 key projects were proposed for the basic metals, basic chemicals and multifarious industry sectors, with total investment requirements of nearly $12 billion. Among these were 18 projects for the basic metals sector, with total planned investment of US$2.2 billion. Some of these projects were initiated during Repelita III; others are still being negotiated or open for negotiation. Early in 1983, the Government rephased a large number of major public sector projects, but none of the 18 in the basic metals sector appears to be included in the deferred list. Among the 18 projects are several steel fabricating plants for the Cilegon steel complex, as well as factories for the production of diesel engines, railway rolling stock, machine tools, casting and forging blanks, sugar and other processing equipment, heavy electrical machinery, copper cathodes and ship yards.

Repelita IV also includes specific development programmes for promotion of machinery and basic metal industries; machinery and factory equipment; machanised equipment; agricultural machinery and equipment; heavy construction equipment; electronics equipment; electronics; motor vehicles; railways; aviation; shiping; iron and steel; and metal industry (non iron and steel).

Estimates of demand and supply for important industrial products at the five-digit ISIC level have been prepared covering the period 1982/83 - 1986/87. Among the major categories for which such estimates have been made are iron and steel, non-ferrous metal (chiefly aluminium), industrial machinery and utensils, heavy duty and construction equipment, agricultural

and electrical machinery, commercial vehicles, aircraft, ships and railway rolling stock. For all of these, ambitious targets are being set in terms of investment and output. Both capital goods and materials and components production plans aim primarily at meeting growing domestic demand and import substitution.

Chapter III. Long-term Projections of Demand for Capital Goods in Indonesia

3.1 Some Theoretical Considerations

All economic forecasting is difficult, and forecasting the demand for capital goods particularly so.

Capital goods are required to produce other (consumer, intermediate or capital) goods. For any given technology, a particular stock of fixed capital (e.g. machines) is required to produce a particular annual flow of output of finished products. This relationship underlies the acceleration principle which is often incorporated in forecasts of new investment for expansion of capacity. To the requirements for net investment have to be added those for replacement investment, as determined by depreciation and obsolescence of existing equipment. If the task is to estimate demand for capital goods in the economy as a whole, not merely for individual capital-using industries, there remains the further problem of forecasting future rates of growth of demand for the final products of the whole range of capital-using industries. In an open economy, allowance must also be made for that part of domestic demand for each category that is expected to be met by imports and the addition to domestic demand likely to be made by exports.

If the ultimate purpose of estimates of future demand for capital goods is to guide planning for the establishment of domestic capital goods producing industries, precise estimates of future demand for capital goods are not really necessary for an open economy. All that is needed is to determine, for each type of capital good whether (a) domestic demand is likely to be sufficient for economically efficient (optimum scale) domestic production and, if not, whether (b) there are prospects for exports sufficient to enable domestic production to reach this volume and whether (c) domestic production is likely to be competitive with imports, subject to some maximum rate of effective protection (say, 20 or 30 per cent).

3.2 Capital Goods Demand Forecast: Methodology

With this conceptual framework in mind, an attempt has been made, as far as data constraints permit, to make long-term projections of demand for capital goods in Indonesia. Forecasts of the demand for a selected group of

capital goods are generated for the years 1985, 1990 and 2000 under alterntive assumptions about the rate of growth of oil and LNG revenues, the growth of oil and non-oil GDP, and the growth of manufacturing relative to other non-oil sectors.

The methodology combines time series extrapolations of GDP and sectoral shares of GDP with econometrically estimated forecasting equations. These equations relate the demand for particular products to either the current level of overall GDP (a proxy for the ability to import) or to future changes in GDP in the using sector. Thus in the first step GDP components (an 8-sector breakdown) are forecast. In the second step the amounts of capital goods which are required to support the forecast growth of sectoral GDP are computed. The approach follows a middle ground between a detailed econometric model (for which data are not available) and pure time series extrapolation.

The GDP forecasts are broken down into two steps. First, oil and non-oil GDP are forecast separately using econometrically estimated equations which take into account the impact of oil and LNG revenues. In the second step, sectoral shares of non-oil GDP are forecast for seven non-oil sectors, using logistic equations. Multiplication of the non-oil sectoral shares by the level of non-oil GDP yields levels of sectoral GDP for the non-oil sectors. These are the basis for the "Trend" scenarios.

The demand forecasts are generated in terms of current US dollars. In order to convert them to more meaningful constant dollar (1980 US dollar) values, a price index for equipment is forecast from US data. This forecast takes into account the impact of oil prices on capital goods prices.

Oil prices and Indonesian oil production are important factors in determining the forecast values. Three alternative scenarios (labelled High, Medium and Low) for these variables have been used to generate the capital goods demand forecasts. Additional scenarios have been generated by assuming that the manufacturing sector grows more rapidly than indicated by the time trends. These have been labelled the "Off-trend" scenarios and are based on goals established by Indonesian planners. Thus there are six sets of forecast, based on three "Trend" scenarios and three "Off-trend" scenarios.

3.3 Capital Goods Demand Forecast: Results

The results predict that, even under the most pessimistic views of future oil revenues and the growth of manufacturing, there will be substantial growth in the demand for capital goods in Indonesia. Growth in demand over the 1980-85 period is forecast to be somewhat slower than growth over the 1985-1990 and 1990-2000 periods. Growth rates of demand for non-electrical machinery are forecast to average 15.5 per cent over the period 1980-1990 under the Medium Trend scenario. Rates of growth for food processing machinery and pulp and paper machinery are forecast to be 21 per cent and 14.5 per cent, respectively, over this period. Continuation of this rapid growth over the 1990-2000 period leads to forecast levels of capital goods demand which are large enough to support domestic production of many products. The largest demand is for construction and mining machinery, food processing machinery and pulp and paper machinery.

The "Off-trend" scenarios, which feature more rapid growth of manufacturing, lead to forecasts of the demand for capital goods which are substantially higher than those in the "Trend" scenarios. The achievement of a 25 per cent share of manufacturing in total GDP by the year 2000 is forecast to require a growth rate of capital goods demand in excess of 20 per cent, a rate which may well be too high to sustain over a long period.

The forecast results suggest that the demand for capital goods in Indonesia will grow rapidly, leading to domestic demand which can support a substantial domestic capital goods industry. The establishment of such an industry may well be necessary if Indonesia is to achieve the rapid growth of manufacturing desired by her planners.

In order to develop and expand its domestic capital goods industry, Indonesia must undertake careful and detailed planning. Special attention must be paid to the development of a solid engineering infrastructure, to the forward and backward linkages which tie various products together, to efficient scales of production, and to possible co-operation with other neighbouring countries in research, product development and specialization.

Chapter IV. Capital Goods Production in Developing Countries: International Experience

Before turning from the analysis of past performance and future prospects for capital goods production in Indonesia to policy recommendations, it may be useful to glance briefly at international experience of developing countries. This chapter begins with an overview of international trends in trade, production and consumption of capital goods. It then focuses first on Latin American experience and then on two particularly interesting cases: the role of multinationals in Brazil and of technological innovation in the Republic of Korea. The second part of the chapter examines a range of problems that have been encountered by developing countries at the industry and plant level.

4.1 International Trends in Capital Goods

International trade in capital goods is, not surprisingly, dominated by the developed countries. They accounted in 1978 for 88 per cent of exports and 60 per cent of imports. The centrally planned economies had another 10 per cent of balanced trade. The developing countries are overwhelmingly net importers, with 30 per cent of imports but only 2.6 per cent of exports (1978).

Between 1970 and 1978 the developing countries increased their share in trade in engineering products only marginally, but in absolute terms their exports of engineering products increased almost tenfold, to US$ 9.4 billion. As in the case of the developed countries, a relatively small number of developing countries accounted for the bulk of this trade. In 1979, only six developing countries (Singapore, the Republic of Korea, Hong Kong, Brazil, Yugoslavia and Argentina, in that order) recorded exports of machinery and transport equipment in excess of $US 500 million. More than one-half of the exports of the three leading exporting countries fell into class 71 (electrical machinery) and consisted chiefly of electronic products and components, although the Republic of Korea has been developing rapidly as an exporter of other machinery and equipment. More than 50 per cent of these exports went to developed country markets. Brazil and Argentina have become significant exporters of non-electrical machinery and transport equipment, in Brazil's case at a level comparable to those of several OECD countries.

Production of capital goods in developing countries is almost equally concentrated. Seven countries account for almost 90 per cent of the gross output of 46 developing countries. These meet about 60 per cent of their requirements from domestic production and have substantial, though widely varying, export ratios. There is a second group, with domestic procurement ratios above 40 per cent, which comprises some traditional capital goods producers (e.g. Argentina, Colombia, Chile, Egypt) as well as a number of new ones, including two ASEAN countries, the Philippines and Thailand. All the rest, incuding Indonesia, have domestic procurement ratios of less than 25 per cent and little if any exports of engineering products.

By far the largest producers of capital goods among developing countries in terms of number of establishments and employees are the People's Republic of China and India, but Brazil surpasses India in value of gross output, apparent consumption and exports. (No trade figures for China are available). In Brazil, capital goods already account for 29 per cent of exports of manufactures, as compared with only 19 per cent in the Republic of Korea. Brazil had the advantage of a long prior period of engineering industry development for the domestic market, but the Republic of Korea has been rapidly catching up from a starting point of export-oriented development concentrated initially on consumer goods.

4.2 Latin American Experience

In the years after World War II, much of Latin America embarked on a deliberate policy of industrialization based on import substitution, in the belief that manufacturing industry could serve as the dynamic engine of growth, creating employment for rural surplus labour, absorbing modern technology, reducing dependence on world markets for primary products and on imports of manufactures, and thus overcoming chronic balance of payments problems. By the end of the 1950s, the most influential exponent of this strategy, Dr. Raul Prebisch, had come to the conclusion that the strategy was largely failing to achieve the hoped-for objectives. Import dependence was not being reduced, unemployment was not being significantly alleviated, balance of payments problems remained. He concluded that Latin American countries had to seek export markets for manufactures. His first approach was to recommend schemes of regional integration, to expand the horizons of manufacturers from domestic to regional markets, but none of these schemes

(LAFTA, CACM, Andean Pact) proved very successful. In his proposals for UNCTAD I he emphasised the need for developing countries to look to the large and growing markets of the advanced industrial countries and urged the latter to assist through preferential tariff concessions. Some Latin American countries, especially Brazil, have followed this strategy with considerable success. The majority have continued to rely in their industrial development primarily on production for the domestic market. Both the less and the more export-oriented Latin American countries, however, in contrast to the east Asian NICs, have from the beginning put considerable emphasis on engineering industries and domestic production of capital goods.

Growth rates of GDP and industrial production in most Latin American countries have been a good deal lower, especially in the 1970s, than in the east Asian industrializing countries, growth of GDP averaging about 5 per cent and of industrial production about 6 per cent a year. Alongside this overall growth, there have been considerable changes in the structure of Latin American manufacturing industries. The share of non-durable consumer goods in total industrial value added has fallen from two-thirds in 1950 to one-third in 1977, while the share of metal-working industry (ISIC 383) has risen from 11 to 25 per cent. Within the metal-working branch, the largest increases were recorded by electrical machinery (from 1 to 6 per cent) and transport equipment (2 to 9 per cent).

A breakdown by three subregions - Brazil, the Andean Group and Central America - shows the increasing role of engineering products in the course of industrial development. While in Brazil their share had already passed 15 per cent by 1960 it did not reach this figure in the Andean Group countries until 1977 when Central America still registered a share of barely 10 per cent. Among sub-sectors, transport equipment moved ahead of others in Brazil, followed by non-electrical machinery (the sub-sector containing most capital goods). In the other sub-regions, fabricated metal products still recorded the largest share in 1977. These figures reflect the fact that Brazil's dynamic growth in engineering industry has relied heavily on development of its automotive sub-sector. The Andean Group have also sought to develop automotive production beyond mere assembly of passenger cars but as yet with indifferent success. The prospects for any such development in Central America are meagre, since the minimum scale of economic production is far larger than the small domestic market and realistic export prospects combined.

Latin American governments have all given high priority to industrial development of one kind or another and have sought to pursue this objective with a variety of industrial policies, including various forms of promotion, protection and support activities, such as investment in infrastructure, technical education, development finance, and in varying degree in different countries also by more direct intervention by the state acting as entrepreneur or as buyer of industrial products. Direct ownership has been important in steel production (accounting for 60-100 per cent in Argentina, Mexico, Brazil, Chile, Venezuela and Peru) and in petroleum refining and petrochemicals in most of these countries. But governments have generally refrained from competing with the private sector in most other branches of manufacturing, except in instances where governments have taken over weak companies to maintain employment. The role of foreign investment by multinationals has been contentious, but most Latin American countries have seen a need for their participation in industrial development requiring high technology and large investments.

Because of the importance of the role of multinationals and technological innovation in engineering development, it is instructive to look at two case studies, the role of multinationals in Brazil and promotion of technological innovation in the Republic of Korea.

4.3 Two Case Studies

Transnational companies in Brazil have a production share of 46 per cent in capital goods and 56 per cent in durable consumer goods. Both figures are far higher than for the other two major branches of engineering industry, intermediate products (35 per cent) and non-durable consumer goods (16 per cent). The difference is largely explained by the advantage which multinationals enjoy in advanced technology and access to export markets. Both of these are of greater importance in automotive and capital goods production than in the other two branches of manufacturing if allowance is made for the major role of state enterprise in steel and petrochemical production. The transport equipment sector, and to a less extent electrical and telecommunications equipment production, show larger investment per (multinational) company than the other sectors.

Korean production of capital goods began with shipbuilding, motor vehicle, general machinery and electronics industries in the 1960s. During the 1970s, further policies were adopted to expand machinery production, including schemes to promote heavy electrical machinery, machine tool and textile and agricultural machinery industry, and designation of 85 kinds of key machinery and 35 types of specialized machines for early development. An institute for applied research and quality control was established to upgrade the technological capability of Korean machinery industries. Between 1960 and 1975, the share of the machinery industry in total manufacturing output doubled, with an annual growth rate of 21 per cent, a growth performance due in considerable degree to the incentives provided by government to create a technology base for the industry.

In 1979 a new scheme to facilitate the development of industrial technology for capital goods production was adopted. Its central feature was the designation of certain capital goods as "Newly Developed Innovative Machines" (NDIM) and the offer of special incentives for their production and purchase. Among other requirements for NDIM status were that the product was developed with local patents, without technical co-operation from abroad, with at least 60 per cent of local components (and no foreign components for critical functions) and that no NDIM was an exact copy of a foreign product. Quality of NDIM had to be certified by an independent quality inspection laboratory.

A sample study of innovative entrepreneurs under the scheme has shown that 85 per cent of them were small and medium-sized companies, confirming similar findings in other industrializing countries which suggest that small companies tend to respond more flexibly to opportunities for innovation. Approximately two-thirds of the technological innovations arose in response to market needs, rather than mere technological feasibility. In more than half the cases, the innovative company received outside technical assistance from research institutions or potential users of the product.

4.4 Experience at the Micro Level

Developing countries embark on the production of capital goods for a variety of reasons: to ensure a steady and reliable supply of this key type of input, to take advantage of potential comparative advantage based on low

costs of skilled labour, to secure the benefits of spin-off from the capital goods branch to raise the level of technology of the entire manufacturing sector, and to develop a capacity to produce machines embodying specifications and designs appropriate to their countries' factor proportions. Indonesia is now embarking on such a strategy. For a programme of this kind to achieve the intended benefits, it is essential to ensure cost efficiency in domestic capital goods producton. The experience of a selected group of NICs (Argentina, Brazil, India, the Republic of Korea, Mexico, Pakistan and the Province of Taiwan) and of the problems they have encountered in capital goods industries (defined here as comprising industrial and agricultural machinery but excluding vehicles and electrical equipment) may offer valuable guidance.

While skilled operatives in developing countries receive relatively low wages, this ensures a competitive advantage only if the wage differential is not nullified by proportionately lower labour productivity. Two aspects of labour productivity need to be distinguished: "task" productivity (the number of items produced per minute by a worker on a set task) and "plant" productivity (output per operating day which depends on plant features beyond the operative's control). Most observations of factories in NICs indicate that "task" productivity is quite high, despite the use of less sophisticated machinery. In many activities, performance equals that of workers in developed countries, and it is rarely less than 30 per cent of their level. "Plant" productivity, however, is often much lower. In India, for example, labour productivity in the best firmss in the textile-machinery sector was estimated at one-third of that in European countries, in the worst at one-tenth. Similarly, a study in the Republic of Korea found average labour productivity in the entire mechanical engineering sector to be 20-30 per cent of that in Britain and the USA, although wages were still lower (by 90 per cent or more) than in these countries.

Lower productivity at the task level in developing countries, when it was observed, was attributed chiefly to inadequate instruction about the best use of a machine tool, clogged floor space, poor quality tools, inadequate technical aids and failure to use jigs and fixtures in setting-up operations. Low plant productivity is chiefly a function of plant layout and scheduling. The typical plant in Mexico, Brazil and India exhibited poor layout in which the movement of the work-in-process interfered with operations at work

stations. Poor scheduling, observed in a study of forging in India, resulting in reduced use of labour and equipment, delays in identifying and correcting errors and in high interest charges on semi-finished inventory carrying costs.

Low capacity utilization is another characteristic feature of machinery production in developing countries. Mechanical engineering plants usually employ some costly items, such as machine tools, fixtures and welding equipment. Each can be fully utilized only if a plant produces a large batch of items of a single type or a range of products requiring a similar operation such as stamping. At low volumes of output, low utilization rates are unavoidable. Addition of export markets to a small domestic market is one way of reducing this problem.

Materials management is another problem area. Studies in India and elsewhere have observed floor space cluttered with accumulated sand from castings, and fabrication and assembly operations crowded in any place that happens to have room available. The almost universal characteristic is congestion and a mixing of operations which frequently leads to poor quality production.

Sub-contracting has proved an important way of reducing costs in machinery producing sectors. Small firms concentrating on a few operations or components are able to use special purpose equipment fully and to benefit from learning by doing in a specialized area. Two conditions need to be met to reap the potential benefits of sub-contracting. The mother firm must be able to co-ordinate multiple sources of supply so that production is not interrupted by bottlenecks, and the sub-contractors must be efficient and reliable. In contrast to Japan, where sub-contracting played a very major role in the process of industrialization, sub-contracting is exceptional in east Asia and Latin American NICs. The organization costs of sub-contracting, it seems, tend to outweigh the cost reductions that can be derived from it. Related to sub-contracting is failure to make use of opportunities for rebuilding of equipment. The cost of rebuilding is often much below that of new machines, and rebuilding makes it possible to incorporate newly available features. While rebuilding is common in developed countries, it seems non-existent in the Republic of Korea, the Province of Taiwan or the Philippines.

Efficient machinery production presupposes well developed casting and forging facilities, activities which are intensive in skilled labour and do not justify the cost of mechanization except at very high volumes. Foundry and forging operations in developing countries are typically very much less capital-intensive than in developed countries. In India, the capital-labour ratio has been found to be $US 3,500 per worker, as compared with $US 25,000 in developed countries, but the savings in fixed costs are not reflected in greater competitiveness. The price of Indian forgings of comparable quality is on average 50 per cent above the cif price of imported ones. The explanation is partly factors external to the firm, such as high cost and erratic supply of materials, and partly internal inefficiency and small production runs. Similar difficulties have been encountered in the Republic of Korea, such as wastage of material in unnecessarily heavy forging blanks.

Superimposed on the technical difficulties faced by an infant capital goods sector, such as those surveyed in the preceding paragraphs, may be additional difficulties caused by misguided policies designed to foster the sector's development. In the Republic of Korea, Mexico and India, for example, early emphasis on encouragement of large-scale firms through low-interest loans and tax incentives resulted in the purchase of equipment several times too large for the domestic market. Emphasis on size often leads to laxity about quality. High quality is particularly important for machine tools. If locally produced machine tools are not adequate for high precision work, they can compromise the competitiveness of the equipment producing sector.

As developed countries have lost competitive advantage in the production of simple standard machines and have been obliged to concentrate on higher technology production, a potential export market for simple machines has opened up for developing countries, both in developed and in other developing countries. Developed countries import primarily conventional lathes, drilling and grinding machines demand for which tends to be highly price elastic. The unit price of machines imported by Japan from developing countries, for example, is less than one-tenth that of machines imported from developed countries, which suggests a developing country advantage in the cheaper type of machine and/or in price of any given type of machine.

Given the relative abundance of labour in developing countries, one would expect them to produce machines designed for relatively labour-intensive processes. What little evidence is available does not support this presumption. One reason may be that the evidence is restricted to large firms which often produce under licence and behind protective tariff walls and therefore have little incentive to adapt factor proportions to prevailing relative factor prices. Small producers are more likely to face competitive factor and product markets and therefore feel obliged to adapt imported designs or produce their own, copying and adapting existing equipment.

Relying solely on equipment of older vintage is liable to leave developing countries with a technological disadvantage. Design research then becomes an important additional influence on competitiveness in the longer run. There is evidence of efforts by companies in NICs to modify and upgrade imported designs to produce a machine that permits a lower capital-labour ratio in the using sector. An example is that of Argentine companies manufacturing food-processing equipment that is less mechanised than developed-country equipment designed for the same product. But the general weight of the evidence is that developing countries do not devote enough effort and resources to research, and this applies even to the NICs. Much of the limited research undertaken in developing countries is process related and pertains primarily to design. Technology development is an infant industry that requires intensive, though temporary, nurturing.

Chapter V. Potential for Development of a Selective Capital Goods Industry

5.1 Introduction

The Government of Indonesia, within the context of planning for further development of capital goods production during Repelita IV, has requested UNIDO to report specifically on the potential for domestic production of equipment for the following industries:

1. Coconut oil
2. Palm oil
3. Rubber
4. Sugar
5. Cocoa, coffee, tea
6. Wood
7. Cement
8. Textiles

UNIDO was asked to address the following questions: Which engineering industries within this group could be developed relatively easily and why? Which types of equipment could be produced domestically, how, where and by whom? Could examples of (say) 25 projects be given which would be promising candidates for promotion? What follow-up studies would be required?

It should be said at the outset that, for lack of data and time, only very tentative and partial answer can be given to these questions at this stage. On many relevant and indeed essential aspects, even of the present situation in Indonesia, the required statistical data have not been available or have proved inadequate.

In general, Repelita IV target figures for output, and hence processing equipment requirements, have been taken as the starting point. But it should be recognised that, even if planning and investment decisions were taken expeditiously, actual production of equipment in the selected industries is most unlikely to become available before Repelita V.

Adequate assessment of the potential for future domestic production of equipment for these industries requires detailed knowledge of current

technology and expert assessment of technological trends. Every effort has been made to draw on the expertise of international equipment producers to make the best possible judgements. The most serious difficulty has proved to be that hardly any of the economic data are available which are needed to assess whether domestic production of the many hundreds of items of equipment would not merely be technically possible in Indonesia but would also be economic, in the sense of not requiring very high rates of effective protection from import competition (by tariffs, subsidies or controls) with consequent economic burdens on the Indonesian user industries. All recommendations for the establishment or expansion of equipment producing facilities in this report should therefore be regarded as provisional, subject to confirmation by means of detailed sub-sectoral studies of economic, as contrasted with merely technical, feasibility.

5.2 Criteria for Selection

5.2.1 Processing Industries.

Indonesia already has a wide range of industries processing domestically produced raw materials, including staple foods (such as rice), cash crops (such as rubber) and minerals (such as petroleum). Processing may be for export or for the domestic market. If raw materials are at present exported in unprocessed form, a policy of further domestic processing before export is called "export substitution". If a domestically produced raw material is processed abroad for reimport into Indonesia in processed form (e.g. crude oil refined in Singapore or rubber processed abroad for import into Indonesia of the finished product), a policy of domestic processing implies import substitution.

Whether export or import substitution is desirable depends on the prospects for efficient domestic processing. The mere fact that a new industry processes domestically produced raw materials for the domestic market does not, in itself, prove that it represents a more efficient use of scarce resources than some alternative industrial development, but there is a presumption that there will be a saving in transport costs. The presumption is much less in the case of export substitution. The domestic export industry will benefit by improved international competitiveness if domestic processing

is efficient (in terms of costs and quality); it will suffer if domestic processing is relatively inefficient. Even in terms of net foreign exchange saving, the effect on the balance of payments may be negative, as in the case of import replacement in shipping if the net effect is higher freight charges which reduce the competitiveness of the country's export industries.

5.2.2 Processing-equipment Producing Industries.

Similar but distinct questions are raised by a policy of import substitution through the domestic production of processing equipment (machinery, etc.). Clearly, there are cases, such as petroleum refining, where the equipment is so capital and technology intensive that its domestic production is beyond the reach of Indonesia at the present stage. But there is a wide range of processing equipment, such as crumb rubber factories or edible oil processing plants, most of the equipment for which is relatively simple, with no very high requirements in terms of skills, capital or technology. The great advantage in selecting such processing equipment for import substitution, in preference to other engineering idustries, is that by assumption a substantial market exists. A large volume of output is produced in Indonesia by the user industries and most of this output requires machinery-using processing. Future demand prospects depend on the expected rate of growth of demand and productive capacity for the product and on replacement demand as existing processing equipment wears out.

Here again, there is no certainty that import-replacement will be an economic proposition. If a new domestic equipment-producing industry (e.g. producing rice mills or crumb rubber plants) is uncompetitive with imports in price and/or quality, the effects on the raw material (rice or rubber) producing industries may be disastrous. Conversely, if the new industry is able to adapt equipment knowledgeably to the special requirements of the domestic raw materials and the tastes and needs of (foreign and domestic) markets, it may benefit the agricultual sector.

There are some considerations, often called "developmental" or "social" (although economists would prefer to think of them as involving externalities) which may reasonably modify conclusions reached on the basis of the preceding criteria. Among them are "learning by doing", backward and forward "linkages" of domestic equipment production, better adaptation of equipment to domestic

factor proportions, employment effects and location for regional development. There is no doubt that such externalities may justify, from a longer-term social point of view, investment that would not appear economic in the short run or attractive to private investors. But the uncertainty of such external effects, and the virtual impossibility of quantifying them, make reliance on them as a guide to investment decisions dangerous - at best an act of faith, at worst an excuse for malinvestment of scarce capital and protection of vested interests.

5.3 Indonesia's Present Processing-equipment Producing Industry: Inadequacies and Constraints

Some of the metal working enterprises in Surabaya, Jakarta, Bandung and Medan that are either already producing equipment or spare parts for processing industries or have the potential to do so, were visited by a UNIDO mission in October/November 1983 in order to assess their current capability. The most striking impression was that most of the machine tools and other equipment used are very old and of obsolete design. The machine shops generally lack the necessary families of machine tools, particularly milling, grinding and boring machines, which are necessary for minimum-quality production. Some of the units had their own foundries, but these also were ill equipped. It was evident that investment in machine tools and equipment had been completely neglected over long periods.

Some of the older establishments suffer from poor layout, cluttered space around the machines, which make orderly work flow and efficient handling virtually impossible. With one exception, none of the establishments visited practised production planning or production control. Operation workers were generally without instructions on selection of materials, sequence of operations, etc. necessary for efficient production, while the absence of job cards recording the timing of operations precluded any accurate assessment of costs of production. Designs of equipment were invariably obtained from the foreign contractors for the processing plants and followed without adaptation to the local conditions. Faulty design of equipment was evidently at the root of some problems of the user industries. Another constraint is lack of standardisation.

As regards production processes, the mission found one modern foundry in Gresik and a workshop in Bandung making large castings for tea rolling machines which were found to be of good quality, thanks to the technical guidance provided by the Metal Industry Development Centre (MIDC). But the captive foundries in the older metal working establishments were ill equipped, leading to poor quality products with a high rejection rate. There is ample scope, with the help of MIDC and its regional branches for putting to use existing underutilised capacity in the modern foundries, such as that in Gresik. Quality of machining is generally poor, chiefly owing to the age of the machine tools used, although one joint venture enterprise in Medan producing palm oil processing equipment was found to have a good machine shop. By contrast, the quality of welding was generally very high.

Three key constraints evident almost everywhere were the lack of any quality control, leading to poor performance and breakdowns in the user industries; unsystematic management without any systems of production and cost control; and almost complete neglect of equipment maintenance.

These failings of the present Indonesian equipment producing industry should not be taken to imply that domestic equipment production is impracticable or undesirable. But they highlight the need to raise standards of efficiency if domestic equipment production is to be promoted on a larger scale. The most important requirements are the development of a pool of manpower with adequate engineering skills; of design personnel and design standards; of machinists and line personnel, such as foremen; of quality control systems; of more adequate production and financial mangement; and of maintenance procedures, including training of maintenance personnel; and especially for export marketing capability.

5.4 Edible Oil Processing Equipment

Indonesia has two large edible oil producing industries, coconut oil and palm oil. While coconuts and coconut oil are still largely produced on a subsistence basis and marketed production has been increasingly absorbed by the domestic market, so that Indonesia has changed from an exporter to a net importer, palm oil producion has been expanding rapidly. The main problem of the coconut industry has been aging trees and declining yields, due to decades of neglect of replanting. The Government has embarked on an ambitious

rejuvenation programme, including replanting of 35,000 ha and improvement of strains and methods of cultivation. While coconut palms are almost entirely on smallholdings, palm oil is an estate industry. There are some 50 estates, chiefly in North Sumatra. Since harvested fruit must be processed within a specified time, all estates have a primary processing (extraction) facility, and in practice even secondary processing (refining) is usually linked to the plantation. Palm oil production expanded rapidly until 1977, then more slowly for some years. A government decision to divert palm oil sales from export to the domestic market in order to free coconut oil for the export market contributed to a fall in output in 1982. Repelita IV projections envisage large increases in both coconut and palm oil production during 1984-88, by more than 100 per cent in the case of palm oil. Much of the expansion is to be achieved through a nucleus estates programme.

There are three alternative methods of primary processing (extraction) of coconut oil and a somewhat different one for palm oil. For secondary processing (refining), however,although different processes have been used in the past, there is one process (physical refining) which is the same for both. Its obvious advantage for Indonesia is that it reduces the technological variables in the domestic production of refining equipment. A very wide range of equipment, varying from relatively simple tools and structures to technologically quite complex machinery, is required in both the primary and the secondary processing industries for edible oils.

Coconut oil extraction in Indonesia was carried out in 1980 by some 380 enterprises, many very small-scale, with an annual capacity of 850,000 tons but actual production of only 325,000 tons per annum. Assuming 80 per cent normal capacity utilisation, output could be raised to 680,000 tons per annum with existing capacity, equivalent to a copra intake of 1,240,000 tons, well in excess even of the Repelita IV target for 1988. No additional capacity, therefore, appears needed for coconut oil extraction from copra. A shift to wet processing on the outer islands would require new capacity. The expansion of output from newly producing oil palm plantations will in any case require a substantial increase in capacity for palm oil extraction. Capacity for edible oil refining in 105 plants was reported to be 282,000 tons per annum, with actual production in 1982 of 254,000 tons which implies a very high (90 per cent) degree of capacity utilisation. Additional capacity for 200,000 tons per annum will be required during 1984-88.

There is a limited production of coconut processing equipment in Indonesia, forty items of equipment valued at Rp. 21 million in 1980. For the palm oil sector, the field mission identified seven equipment producers, five in Medan and two in Surabaya. Only three of these, however, were capable of acting as general contractors, and all three need enhanced engineering capability. The quality of equipment produced by the other four enterprises is poor. Most of the more specialised equipment for palm oil extraction is not as yet produced in Indonesia. No corresponding information was available for coconut oil processing. The equipment for edible oil refining is still wholly imported, except for some civil works and steel structure components.

The annual investment required for new and replacement investment during Repelita IV in edible oil processing equipment (and equipment producing capacity) is estimated at about US $103 million. Some crude oil extraction equipment is already produced locally and domestic production of most of the rest may be expected in due course. The situation is different for refining equipment where lack of engineering capacity presents a major obstacle even for the simpler equipment. It is assumed that by 1985 some 30 per cent of refining equipment should be technically capable of being produced locally and that local content could subsequently be increased by (say) 10 per cent a year. As in the case of the sugar and cement industries, the favoured approach is the establishment of one or more general engineering facilities acting as general contractors. They should be joint ventures in order to draw on the experience and technical knowhow of a leading international edible oil equipment producer. One of its tasks would be to advise on the sequence of technically and economically feasible extension of equipment production.

5.5 Rubber producing equipment

Although synthetic rubbers have become increasingly important, natural rubber still has advantages as a raw material because of its versatility and for special uses (e.g. where heat resistance is important) and the steep rise in the cost of synthetic rubber which followed the oil price increases of the 1970s has improved the competitive position of natural rubber in world markets. Indonesia is second only to Malaysia among rubber producers, with an average share of 25 per cent in world production.

About one-third of Indonesia's output of rubber is produced by estates and two-thirds by smallholders. A programme of extension of area and replanting has succeeded in significantly increasing productive capacity, though it will be some years before the programme becomes fully effective in terms of output. Efforts to upgrade the quality of Indonesian smallholder rubber through better methods of processing have met with some success, but problems remain.

More than two-thirds of Indonesian rubber output is exported as crumb rubber and about 20 per cent as rubber smoked sheet (RSS) in various quality grades. The value of rubber exports declined sharply in 1981 and 1982 with the world wide recession but some recovery is under way. Small quantities of rubber are imported, mainly synthetic rubber and finished goods. The Repelita IV target for 1988 is 1.5 million tons of rubber. Export prospects are favourable, and domestic absorption is expected to rise to 200,000 by 1988.

Rubber processing proceeds in two stages. The purpose of primary processing is to stabilise and concentrate the natural latex, mostly by centrifugation or creaming. Secondary processing can take several forms. The traditional technology, which yields smoked sheet, involves coagulation of latex, followed by rolling and drying in smoking sheds. In the past decade, the traditional method has been largely superseded by crumb rubber, in the hope of producing a product of superior and more homogeneous quality. After cleaning and coagulation, the rubber is crumbed by a machine with rotary blades or a pelletiser. A third process produces crepe rubber, a product of high quality, by repeated shearing and masticating by a rolling machine and simultaneous washing. A new technique, not yet in use in Indonesia, is powdered rubber, produced by spray-drying of latex and granulating crumb rubber. It has advantages in saving of energy and labour in mixing and compounding, but low density and consequent high storage and transport cost make it unsuitable for export.

A boom in crumb rubber in the early 1970s saw the establishment of 150 factories, mainly by private enterprises. Excess capacity led to many brankruptcies and running down of installed capacity. In 1983, some 100 crumb rubber plants were operating in Indonesia with an installed capacity of some 700,000 tons per annum, but capacity utilisation was only 56 per cent. How

much of the excess capacity was effective is not known. No corresponding data are available on the rest of the rubber processing industry which consists mostly of smallholders and small-scale enterprises. There is considerable rubber manufacture. In 1980 some 166 enterprises, employing 31,000 persons, produced tyres and other finished products, equivalent in terms of value added to 4.8 per cent of all manufacturing.

Most equipment, such as tanks, for the traditional methods of rubber processing is locally made by traditional methods. The main equipment for production of concentrated latex, centrifuges are usually imported (largely from Germany); in view of their technical complexity and declining demand for the product, domestic production is unlikely. Nor is any of the equipment used for crumb rubber production as yet made domestically, although most of the items, such as shredders, washing tanks, conveyors, driers and compactors, are relatively simple. The equipment for the present plants was originally imported from Great Britain. If the data on capacity utilisation are correct, greatly increased output could be obtained without new investment, unless the additional planned production is in areas too remote from the existing processing plants. The Government is reported to be planning to install six new crumb rubber plants, a number too small for economic domestic production. Whether there would be enough replacement demand could be determined only by a survey of the existing 151 enterprises. Demand for the machines needed for creping is also unlikely to be large enough for economic domestic production, though the possibility of production under ASEAN complementation arrangements may be worth examining. The potential importance of powdered rubber is such that a feasibility study of domestic manufacture is desirable.

5.6 Sugar processing equipment

Although sugar production has been growing rapidly, at an average rate of 8 per cent per annum (1976-81), it has not been able to match the growth of domestic consumption, so that sugar has had to be imported in increasing volume. More than half of Indonesia's cane sugar is still produced on (mainly government-owned) estates, but the share of smallholder production has been rising, partly because of a deliberate policy of transforming the sugar industry from an estate to a smallholder structure, and yields on smallholdings have been rising, although they remain much below yields on

estates. Indonesia also produces some 350-400,000 tons of brown sugar, largely on a subsistence basis.

Sugar production is expected to grow during Repelita IV at a somewhat slower rate than during Repelita III, but the Government hopes to meet all domestic demand and return Indonesia to a net export position. To meet these targets, a substantial programme for expansion of area under sugar cane establishment of new mills is planned, both on the outer islands.

The great majority of Indonesia's 58 (1983) sugar mills are government owned (51) and all but three are on Java. One, in Lampung, is a foreign investment project. Since the mid-1970 a large factory rehabilitation programme financed by a World Bank loan has been under way. Repelita IV envisages an increase in sugar processing capacity by 800,000 tons by 1988, equivalent to 12 new mills. The Government in fact plans to build 12 new mills, all but two on the outer islands; six are under construction and a seventh has been commissioned. Beyond 1988, two more mills will have to be commissioned every three years to meet projected demand.

The seven mills under construction have been commissioned on the conditions that the international equipment supplier cooperate with a domestic equipment manufacturing company and that a local content of about 60 per cent be achieved. There are at present six local companies (three state-owned an three private) engaged in engineering planning of sugar mills and production of various kinds of equipment. Some have begun to manufacture centrifuges under licence. The next mills to be commissioned are to have an Indonesian company as the main contractor supported by an international sub-contractor; local content is to be raised towards 80 per cent. A wide range of parts is also produced, mainly on the often well equipped repair shops of the mills.

Assuming that local content of the five new mills to be installed by 1988 reaches 70 per cent, US $28 million per year investment in new processing capacity will be required. Adding replacement of outdated equipment and spare parts, and investment in equipment producing capacity, raises total investment requirements for technically feasible local production to US $78 million a year.

5.7 Processing equipment for cocoa, coffee and tea

Indonesia has not hitherto been a significant producer of cocoa. In 1981, some 15,000 tons were produced, mainly on government estates. A programme of replanting and extension of estates is expected to increase output substantially during the 1980s. Most cocoa is exported, chiefly in the form of beans, powder and paste, but there are also imports of beans for quality blending.

By contrast, Indonesia is a major coffee producer, ranking fourth after Brazil, Colombia and the Ivory Coast. Coffee is mainly a smallholder crop. The bulk of Indonesia's coffee is robusta. The world coffee boom of the mid-1970s greatly benefited Indonesia's coffee growers, and coffee exports reached US $656 million in 1980. Prices then declined and the value of exports fell by nearly fifty per cent in 1981, but there has been some recovery since.

Tea is predominantly an estate crop, grown chiefly on higher ground in Java. Most estate tea is processed to black tea for export. Indonesia ranks fourth among tea exporting countries, but tea accounts for only three per cent of non-oil export earnings.

For all three of these estate/smallholder crops, Repelita IV envisages ambitious output targets, in the cases of cocoa and coffee increases by 10,000 tons a year.

Cocoa processing to prepare beans for export involves fermentation, washing, drying and grading; the equipment needed consists of flight conveyors, tray driers and graders. The equipment needed for further processing into paste and cake is more complex and specialised, including grinders, mixers and presses.

Coffee processing involves curing, grading, roasting, blending, grinding and packaging. The chief equipment needed for (wet) processing consists of de-pulpers, pumps, rotary driers, hullers, catadors and vibrating graders; in addition roasters and sieves for roasting, cracking and grinding mills for grinding and some additional equipment for the manufacture of instant coffee.

Processing of tea involves withering, rolling, fermentation, drying and grading. The main items of equipment needed are withering troughs with blowers, rolling machines, sorting machines, driers, graders, packers, heat exchangers and suction winnowers.

The available information on present local equipment production for these processing industries is very inadequate. The simple equipment for cocoa bean processing appears to be mostly made locally. So is some coffee processing equipment, but most of the equipment in use is very old and inefficient, especially driers which at present account for 65 per cent of processing equipment cost. Their inefficiency is largely responsible for the poor quality and low prices that Indonesian coffee commands. Production of tea equipment is carried on in several general workshops, in Bandung and elsewhere.

In view of the similarities among processing equipment for the three crops, especially driers for cocoa and coffee, joint demand could rise to levels sufficient for economic domestic production. Total investment requirements during 1985-88 for the three processing industries are estimated at US $14 million a year of which 80 per cent may be technically capable of local production. In addition, some US $3 million would be needed to enlarge and upgrade equipment production capacity.

5.8 Wood Processing Equipment

More than 60 per cent of Indonesia's land area is covered by tropical forest, but conservation and reafforestion are urgently needed to maintain the country's forestry potential. Official figures indicate 45 million ha of exploitable and another 48 million ha of potentially exploitable forest, but such data need to be treated with caution. They include large areas where exploitation is uneconomic because of high transport costs (e.g. in Irian Jaya) or undesirable for environmental reasons. At present Kalimantan accounts for more than 50 per cent of forest exploitation. The main species cut for export are Meranti (53 per cent) and Ramin (15 per cent).

In 1978, after a decade of very rapid expansion of log exports chiefly to Japan and other east Asian countries for plywood and other processing, the Government of Indonesia decided to enforce increased domestic processing by,

in effect, drastically and progressively restricting export of logs by 1985 and promoting plywood production. The result has been an investment boom in saw mills, veneer and plywood manufacturing. In some cases production plants threatened with shutdown in overseas countries formerly dependent on Indonesian logs have relocated in Indonesia. Between 1979 and 1981, production and exports of logs dropped sharply, while plywood exports have begun to expand, partly offsetting the loss of export earnings.

In wood processing, "primary" processing commonly includes all processing which uses logs as inputs, including plywood and fibre board production as well as saw milling, while "secondary" processing is used to refer to manufacture of wood products, including furniture, joinery and structural wooden elements used in housing such as partitions and roof trusses. While saw milling equipment consists chiefly of the saws themselves, plywood production requires a wide range of partly sophisticated machinery. Wood working machining and assembly equipment can be economically produced in relatively small quantities if labour-intensive processes are employed.

Nominal capacity for saw milling has increased greatly, to 8.1 million m^3 according to official data. But much of this capacity in Kalimantan operates at only 50 cent of capacity because of outdated equipment, and the capacity figures may be inflated by the companies to secure larger export quotas. There is also a large but unknown number of small enterprises using small band or traditional hand saws. The present investment cost of a 3-line saw mill of 70,000 m^3 capacity is US$ 28.6 per m^3, a relatively low figure which indicates low operational quality of the machinery, but there is a trend towards improvement of the end product.

There were in 1983 67 plywood factories in operation, with a production capacity of 3.1 million m^3, running at very high (89 per cent) capacity utilisation and exporting 81 per cent of their output. Another 105 investment applications with a total capacity of 3.6 million m^3 were pending. Investment costs in machinery and equipment show a very wide range from US$ 80 to US$ 480 per m^3. Recent technological developments overseas, may have implications for plywood production planning in Indonesia. Medium-density fibre board (MDF) is rapidly displacing plywood in North America and Europe. An assessment of the desirability of switching from plywood to MDF production for export may become necessary in the near future.

In Indonesia the longer-term future of plywood will depend in part on adequate supplies of the requisite kinds of tropical hardwoods and therefore on an effective reafforestation programme.

Furniture and wood working is predominantly a small-scale industry, with an estimated 4,000 establishments of which at most 10 per cent are mechanised. The industry has grown rapidly in recent years, as is indicated by a remarkable rise in imports of small (workshop type) machinery which have risen from 250-400 pieces a year in 1975 to more than 10,000 pieces in 1982/83.

As regards potential for domestic equipment production in Indonesia, much of the log intake, distribution and transport equipment for saw milling can technically be built in Indonesia, while the saws themselves which are high precision instruments cannot be recommended for local production at this stage. About 30 per cent of the equipment needed for plywood production should be capable of domestic production, and this percentage could rise gradually to 60 per cent. Whether the same would apply to fibre board production remains to be investigated. Driers for which there will be demand also from saw mills and other wood working plants might be domestically produced to the extent of 60 per cent of content, i.e. excluding the extremely difficult control equipment. Of the general purpose machine tools needed for wood working, up to 80 per cent should be technically capable of local production.

Estimates of investment requirements for saw milling and plywood production during Repelita IV reach very high figures - US$ 72-100 million for saw milling and US$ 460 million for plywood. In view of the magnitude of investment requirements and the uncertainty about future demand for plywood, any decisions about domestic production of processing equipment should be preceded by a detailed sub-sectoral study.

5.9 Cement Processing Equipment

Despite very rapid growth in cement production and consumption in the past decade, Indonesia still has by far the lowest per capita consumption among east Asian market economies. While domestic production increased 13-fold to 6.8 million tons in 1981/82, it was outstripped by growth of

consumption, so that 0.5 million tons had to be imported in 1982. Installed capacity of 11.7 million in 1983 was divided between 8 companies, chiefly in Java and Sumatra. Capacity utilisation was rather low, around 65-75 per cent. Most domestic production consists of Portland cement, the most widely used kind, with some specialised production, e.g. for oil wells.

Ambitious expansion plans, to raise cement production capacity to 19.4 million tons by 1987 in order to keep up with rising demand and if possible dispense with imports, have had to be scaled down by financial exigencies. Prospective expansion may now tentatively be put at 19 million for 1987 and 32 million for 1990.

Mechanical equipment accounts for about one-third of the total cost of a cement factory (the other two-thirds being construction costs and commissioning and electrical equipment). Total investment costs of a factory of 0.5 million per annum capacity is about US$ 100 million; for a factory of 1.5 million tons capacity US$ 155 million (implying very large economies of scale). Cement factories are highly sophisticated and technologically complex "products". Suppliers carry all technical risks which are subject to severe penalty clauses. It is therefore not easy for a new supplier to match the experience and credentials of the small number of international cement factory producers.

At present, steel ducting, chutes, tanks and bins are fabricated in Indonesia. These represent less than 40 per cent of equipment costs. The best potential for additional local production is for sheet metal products produced by automatic welding, conveyor and transport systems and for some items of electrical equipment, such as switchboards, low and medium voltage switchgears, cables, control panels, and some others. Some quarry equipment could also be supplied locally; also some spare parts, especially refractory bricks and castings.

Total required annual investment in equipment for cement production is estimated at US$ 400 million during Repelita IV. On a long run basis, which would require much further technical and economic analysis, the local share could rise from one-half to two-thirds in the coming decade. The sophisticated technology of cement production makes it difficult to develop

domestic production of individual components. As in the case of sugar industry, the best strategy is likely to be to aim at the establishment of integrated engineering facilities through joint ventures, on the understanding that there will be a gradual increase of local production of equipment. In co-operation with the joint venture partners policy guidelines could be drawn up for the increase in local content, including incentives for sub-contracting of part of the equipment to domestic firms and the development of production facilities for heavy equipment and machinery. Some of these items might be included in the planning of a General Machine Shop in Surabaya.

5.10 Equipment for the textile industry

The textile industry in Indonesia is so large and diverse that it cannot be covered in any depth in the framework of the present study. An in-depth study would need to assess market prospects at home and abroad for each of the four main sub-sectors - spinning and synthetic fibre production, weaving/knitting, finishing (dyeing, printing, etc.) and garments production. It would need to examine the relevance to Indonesia of the rapid changes in modern textile technology which are going on in the world and which must have profound effects on appropriate equipment for textile plants in the next decade and beyond. Finally, it would need to concern itself with the present condition and future prospects of the small-scale and handicrafts sector and its equipment requirements. None of this has been possible in the short time available. The following analysis, therefore, is even more tentative than that in the other industry studies. It focuses primarily on two sub-sectors of the modern textile industry, yarn and fabric production; it leaves aside both the finishing industry of the modern sector and the small-scale and handicrafts sector.

Textile production increased spectacularly during Repelita II and III. Yarn production increased almost tenfold between 1973 and 1983, output of fabrics nearly sevenfold. In the spinning sub-sector there are about 70 enterprises with an installed capacity of some 200,000 tons. Synthetic fibre production began in the 1970s and now extends to some polyester (filament and fibre), nylon filament and texturised fibre, with a total capacity of about 400 tons per day. Weaving is by far the largest sub-sector of the modern textile sector. It consists of some 90 large enterprises with an average of

210 (automatic) looms, some 1,500 smaller enterprises using some 75,000 power looms and about 5,000 small and medium enterprises which produce textile fabrics using hand looms. In knitting there are 52 large enterprises, while garment manufacturing has 65 large, over 200 medium-sized and an unknown number of small enterprises. The most important development of the past decade has been the establishment, chiefly through Japanese investment, of large integrated textile mills using fairly sophisticated automatic equipment.

Employment in the textile industry has been growing relatively slowly, at 1.75 per cent per annum, largely because of displacement of labour in the informal small-scale sector. Virtually all the raw materials and many other production inputs into the textile industry are still imported. Domestic raw cotton production amounts to only 6,000 tons a year, while imports rose to nearly 120,000 tons by 1980. Rayon and synthetic fibres are also still predominantly imported, although increasing domestic production has kept imports of synthetic fibres fairly stable at about 25,000 tons a year. Considerable efforts have been made in the past decade to stimulate textile exports, chiefly garments, and some success was attained during 1979-80. After falling back during the recession years, exports are now recovering somewhat.

Repelita IV aims at an average growth rate of yarn production of 3.4 per cent a year, of 3.8 per cent for fabric and 12.4 per cent for garments. Synthetic requirements are expected to grow at 3.6 per cent. Almost one-half of garments output will, it is hoped, be exported.

There is some production of equipment, spare parts and components for the textile industry, chiefly for small and medium-scale enterprises. Simple looms are made domestically. But their quality is such that little if any of it can be used in the modern sector. Textile machinery for modern plants is imported, mainly from Japan. One reason why domestic production of spare parts and components is difficult to assess is that much of it is sold under foreign brand names to improve marketability. Domestic products have a substantial price advantage over imported ones, but their quality is much inferior.

The rate of technological progress in textile machinery, especially the development of shuttleless weaving and generally automated production in integrated plants, is such that the technological gap between highly industrialised and developing countries is again widening. Modern equipment is so costly and employs so little labour that it is, prima facie, inappropriate for countries with Indonesia's factor proportions; yet output from these modern plants may well be price as well as quality competitive with labour-intensive production from low-wage countries. In these circumstances, one option for Indonesia is to focus specifically on the equipment needs of the small-scale and handicrafts sector, supplying good-quality cheap equipment which may help it survive. A second, not mutually exclusive option is to secure equipment for the weaving industry by importing second-hand power looms from countries now discarding them in favour of more advanced equipment. From a strictly economic point of view, such redeployment may well be the best course in the short or medium run, but it makes little appeal to planners who seek to raise the country's industrial and technological capability in the long run. A third option is to follow in the footsteps of the previous generation of industrialising countries, such as Brazil, by embarking in gradual stages on domestic production of equipment for the modern textile industry.

In Indonesia, this might well begin with assembly of spinning machines including draw frames, followed by assembly and increasingly local production of looms. Scope for local assembly production may be put at (say) 285 spinning machines at US$ 74,000 each i.e. an investment of US$ 21 million a year, plus at a later stage US$ 3 million for draw frames. Investment required in new capacity for assembly and component production is estimated at US$ 15-20 million. Employment creation might be put at 1,000 new jobs.

In view of the uncertainties surrounding the future of weaving industry development, even tentative estimates of potential domestic production of weaving machinery would be inadvisable. A detailed sub-sectoral analysis is needed.

5.11 Recommendations

The estimates of technically feasible local production of equipment for the selected industries add up to the following aggregate totals:

(i) Investment in equipment during Repelita IV for seven processing industries (excluding textiles) approximately US$ 1,086 million a year; of this

(ii) technically feasible local production of processing equipment approximately US$ 510-600 million a year;

(iii) investment required in additional capacity for processing equipment production approximately US$ 380-410 million;

(iv) direct employment generation in equipment production: 21,000-24,000 jobs.

These are very tentative estimates, subject to many uncertainties which require clarification before any firm judgements can be made. One of the most important facts to be established is the volume of effective excess capacity, both in the processing and in processing equipment producing plants. The amounts of equipment required differs greatly among the various industries considered. Requirements are very much smaller in the cash crop (cocoa, coffee, tea) and probably rubber processing industries than in the others. By far the largest potential is in wood processing. If employment creation is a major criterion, this sector would deserve priority. But very large investment, technology transfer and manpower training would be needed. In terms of employment generation, the edible oil, sugar and cement industries combined come close to wood processing. If Indonesia succeeded in mastering the highly complex technology for assembly and gradual production of textile machinery, employment generation in this sector could also be substantial. But it should once more be underlined that this task will require enormous efforts. In terms of employment, as well as overall economic growth and welfare, the net benefits would be negative if high cost and poor quality equipment imposed additional handicaps on the processing equipment using industries.

Table V.1 presents a list of items of equipment or equipment production facilities which are recommended for further consideration for local manufacture. The list should be regarded as one of "most promising candidates", in the sense that their technical feasibility seems more assured than of other machinery and equipment required by these industries.

Table V.1 Summary of Equipment Production Recommendations

Demand sector		Domestic Equipment Production Recommended as Technically Feasible*
Edible oil		
	extraction	Hammer mills Screw presses
	refining	GEC approach a/
Rubber		Feasibility study of powered rubber process; GEC approach a/
Sugar		Raising local content from 60 to 70 per cent under GEC a/
Estate crops		
	cocoa	3 types of machinery b/
	coffee	6 types of machinery b/
	tea	10 types of machinery b/
Textiles		
	spinning	Ring spinning machines Hank winding machines Draw frames
Wood		
	Saw milling	Driers Installations (up to 50 per cent local content); GEC a/
	Plywood/ fibre board	Raising local content from 30 in stages to 60 per cent, guided by GEC a/
	Wood working	Band saws Circular saws Planing machines Milling machines
Cement		Spare parts Castings, especially grinding balls, guided by GEC a/

* NB All these recommendations are subject to studies of economic feasibility.

a/ GEC = General Engineering Contractor; cf. 4.6 in Part Four, Vol. III.

b/ Cf. section 7.4 in Part Four, Vol. III.

While the equipment requirements of each demand sector have their own peculiarities and require specific approaches to the development of corresponding engineering industries, there are some measures of a general character which may be recommended for follow-up action in relation to all of them. These are:

1. Assistance to equipment producers or industries with potential for equipment production, especially in production management, engineering design, quality control, marketing and manpower training.
2. Assistance in the promotion of an "General Engineering Contractor (GEC) approach" in the establishment of processing plants for sugar, cement, edible oil refining, rubber, saw milling, plywood and fibre board, where a joint venture between an international equipment producer and a domestic company acts as general contractor which sub-contracts production of equipment, with gradually increasing local production.
3. Feasibility studies or sub-sectoral analyses to determine the economic, as well as technical, feasibility of domestic equipment production in the areas tentatively recommended.
4. Promotion of investment and industrial technology transfers through know-how agreements and joint ventures with appropriate foreign partners.
5. Preparation of a sectoral plan for development of the capital goods industry based upon the methodology developed by UNIDO through technical assistance projects in a number of developing countries.
6. Training of manpower, to meet the large new demands that would be made by an extensive programme of capital goods production.
7. Examination of the scope for ASEAN regional complementation arrangements in industries, such as rubber, timber, sugar, palm oil, coconut oil and textiles in which two or more ASEAN countries may be interested in developing domestic production of processing equipment.

A technical assistance programme to support Indonesia's efforts in the above areas is recommended.

Chapter VI. Objectives, Constraints and Policies

6.1 Objectives and Constraints

A number of considerations have led Indonesian policy makers to give serious consideration to the desirability of greater emphasis on manufacturing in general and capital goods production in particular. The likelihood that the oil sector will not continue to propel economic growth to the extent that it has done in the 1970s, both because of less favourable world prices and diminishing exportable surpluses, poses the need for an alternative engine of growth, and manufacturing is the most likely candidate, judging by all past development experience. In Indonesia, industrial development has lagged behind, partly because of the very abundance of oil and other natural resources; and such industrial development as has occurred has been largely confined to production of non-durable consumer goods and more recently durable consumer goods and intermediate products, with little if any production of capital goods. Almost all this development, moreover, has been for the domestic market with relatively high rates of effective protection, with little if any export. As a result, it has not been required to become internationally competitive.

A move into capital goods production is sometimes advocated on the ground that it will fill a "gap" in Indonesia's industrial structure and will achieve a more "balanced" industrial sector. But there is no intrinsic merit in gap-filling or balance. It is true that the development of complementary industries may have favourable "linkage" effects -, external economies which may help reduce costs in other industries or impart a stimulus to other new developments. But it is unrealistic to imagine that a country even as large as Indonesia can aim at a completely self-contained industrial structure, without "gaps". Even the most highly industrialised countries, while most of them produce many capital goods, rely on imports from one another for the great majority.

There is now a *prima facie* case for the development of a capital goods sector in Indonesia. Over the next two decades, such development could mean a major structural change in Indonesia's industrial economy. But unless capital goods can be produced efficiently, that is to say at or near internationally

competitive prices and quality, the domestic user industries will be adversely affected. The net effect on economic growth and employment may be negative.

The best way to ensure international competitiveness is to select industries in which Indonesia is likely to have a comparative advantage, so that no very high rates of effective protection will be needed even in the early stages and some exports may be possible quite soon. It implies a shift from a generally inward-looking towards a more outward-looking industrial development strategy. In the past, Indonesia, like most developing countries in the early stage of industrialisation, has leant towards the former strategy which emphasises replacement of imports in a protected domestic market. It has increasingly come to be recognised that such a strategy is liable to run out of steam as the phase of easy import subtitution draws to a close and to perpetuate dependence on protection by insulating manufacturers from the dynamic stimulus of international competition.

There is a presumption that Indonesia is most likely to have a comparative advantage in resource-based industries and, because of her relative abundance of cheap labour, in relatively labour-intensive industries (and methods of production). A preference for resource-based industries is also likely to promote the objective of better regional balance in industrial development. An emphasis on labour-intensive industries (including, wherever possible, assistance to and involvement of small-scale enterprise) will promote the objective of employment creation (hence more equitable distribution of income) and international competitiveness. All these considerations have led Indonesian economic planners to focus on industries producing processing equipment for agricultural and forestry products.

Formidable obstacles stand in the way. This is not the place to spell out in any detail the constraints that have hampered Indonesian industrial development and the development of a capital goods or engineering sector in particular. Dutch colonial policies and subsequent decades of political instability hampered manufacturing development until Repelita I. What there was of it, as has been mentioned, was, as in most developing countries in the earliest stage of industrialisation, inward-looking import substitution, chiefly of finished consumer goods. Inadequacies of industrial, business and engineering infrastructure, of skilled manpower, of a technological/scientific base and of experienced management were, and remain, serious constraints,

especially in areas such as most capital goods production where more advanced technology matters. A highly regulatory environment inherited from the first two decades after independence, and the increased comparative disadvantage imposed on the whole manufacturing sector by the oil boom of the 1970s further inhibited dynamic entrepreneurial initiatives, although the existing manufacturing industries, producing under cover of high rates of effective protection for a booming home market, experienced rapid growth. If, for the reasons that have been mentioned, selective development of capital goods production is desirable for the 1980s, energetic efforts to remove some of these constraints are an essential prerequisite. Some of the required policies are briefly indicated in the remaining pages of this Main Report.

6.2 Policies

All industrial development presupposes a favourable macroeconomic policy environment - reasonable stability of prices, reasonably stable growth of aggregate demand, reasonable security from violent external shocks.

Specific policies for industrial development can be divided into primarily long-term and primarily medium-term.

Long-term (20-25 years) policies must seek to improve the preconditions i.e. to remedy the constraints mentioned above. Apart from the various kinds of physical and business infrastructure relevant to industrial development, the most important is technical/scientific capability. While in the short- and medium-term, the only way of filling the gaps is reliance on foreign technical assistance in one form or another, the longer-term answer is in technical and scientific education and research. Among the many obstacles in Indonesia are a tendency among middle-class parents and children to look to a humanities or social science rather than a scientific/technological training; and a promotion system which provides virtually no incentives to academics to undertake good academic research.

Medium-term policies, say, for Repelita IV and V, must focus on furtherance of a desirable pattern of industrial development. This means policies to upgrade the efficiency of existing industries and to encourage the development of new industries likely to meet the objectives, i.e. conform to

the desired trade-offs among objectives, of national policy. Such policies can be classified in two categories, planning decisions (i.e. measures aiming at a particular allocation of resources determined by administrative decision) and market incentive measures (i.e. measures designed to promote the efficient operation of market forces in guiding investment and other resource allocation decision). While industrial policy making will in practice always employ a combination of both, there are reasons for thinking that an emphasis on the latter approach may be more conducive to economic efficiency and thus international competitiveness.

It is now widely recognised that Indonesian manufacturing industry has suffered from excessive regulation by government. Traditional attitudes and reaction against laissez faire liberalism have combined to impose on industrial development a straitjacket of bureaucratic regulation which has made efficient, flexible and dynamic enterprise extremely difficult. A belief that pribumi businessmen cannot compete with non-pribumi - a belief no longer necessarily justified - has reinforced these tendencies. Taking risks in deregulation may be the single most effective contribution that government can make to industrial development.

This is in no way inconsistent with a policy of giving public enterprises and government procurement an important role in supporting the development of efficient domestic capital goods production. Preference in domestic procurement may be merely a disguised form of protection for uncompetitive firms. But it can also help overcome ingrained prejudice in favour of established brand names of multinational corporations whose products may not necessarily be optimal for Indonesian conditions.

Turning from such general considerations of industrial policy to measures particularly relevant to the promotion of capital goods industries, and more particularly, industries producing processing equipment, there are a number of policies which may be helpful in promoting efficient development of whatever industries have been selected by the criteria indicated above:

a. Sub-contracting. There is a good deal of evidence that production of components and parts by small firms acting as sub-contractors would not only be desirable as a form of assistance to small-scale enterprise but could

actually increase efficiency through specialisation and because of the greater capacity of small firms to adapt and adjust. Measures should be devised to remove some of the obstacles which have largely prevented the practice of sub-contracting in Indonesia.

b. Standardisation of Components. Quite a number of types of equipment (or components) are used by more than one processing industry, e.g. presses, driers, pumps, etc. So long as each industry uses equipment or components with different specifications, the volume of demand for each may be inadequate for economic domestic production. Where standardisation is possible without adverse effects on the user inutry, it could be helpful in achieving an adequate volume of demand.

c. Quality Control. Poor quality control has been identified as one of the most serious weaknesses of almost all enterprises at present engaged in processing equipment production in Indonesia. At the same time, some outstanding exceptions of good quality production under the guidance of the Bandung Metal Indutry Development Centre came to the notice of the UNIDO field mission. The example of the Republic of Korea where the establishment of an Institute for Machinery and Metals made a major contribution to upgrading technical capability and an independent quality inspection laboratory under the "Newly Developed Innovative Machines" incentive scheme to the maintenance of high quality (see Part Three, Volume III) may have valuable lessons for Indonesia.

d. Research and Development. There are several institutions in Indonesia, besides the MIDC in Bandung, with a potential role in raising the technological capability of industry by the promotion of research and development (R & D). Among them are the Institute of Technology (ITB) in Bandung, the Material Testing Institute (MTI) in Bandung and the Centre for Development Research, Science and Technology (PUSPIPTEK) at Serpong near Jakarta. Besides these scientific and technical institutions, there is the Agency for the Assessment and Application of Technology (BPPT), created in 1979 and reorganised in 1982, with the task of advising government agencies and the private sector on technology development. Its chairman is the Minister of State for Research and Technology and among its 22 directorates are several with relevance to capital goods, such as the directorates for

machine and electrotechnical industries, for processing and engineering industries, for defence and strategic industries and for industrial infrastructure. In addition, among its technical operation units, there is a Processing Technology Unit.

Clearly, the institutional framework for R & D is expanding, but the institutes need to change their present relatively passive attitude towards industrial enterprises and play a more active part in stimulating technological development for the manufacturing sector. The UNIDO field mission observed that most enterprises were unaware of the possible R & D and operational support which could be obtained from these institutions. There is need for more promotional efforts on their part and more active co-operation with industry associations and individual enterprises.

e. Industry Associations. In Indonesia, industry associations function at present mainly as lobbying and public relations agencies. They could develop an important role in promoting the managerial and technological capability of their member companies. Their management needs to be entrusted to carefully selected professionals with managerial, financial/accounting and engineering experience. Thus qualified, the associations should extend their work to managerial and technical issues, market analysis, trends in technology (especially overseas), training and education requirements (especially apprenticeship), promotion of sub-contracting, co-operation among members and with enterprises in other sectors, support of R & D activities, promotion of standardisation, co-operation with government in such matters as local content programmes and the formulation of policies and common positions in areas such as investment regulation, credit policy, taxation, foreign trade, environmental control, deregulation and infrastructure. Such an active role of industry associations would be beneficial both to their member enterprises and to the development of their industries in the national interest.

f. Education and Training. Skilled labour, experienced and competent technical staff and (in less degree) commercial middle mangement are scarce in Indonesia. To overcome these deficiencies in the short term it will be necessary to rely, besides technical assistance from abroad, primarily on on-the-job training, workshops and short courses, especially for domestic enterprises without foreign partners. Wherever practicable, overseas

technical and management training facilities, combined with practical experience in overseas plants, should be made available to Indonesian trainees. Besides these short-term measures, it goes without saying that there is continuing need in the longer term to extend and upgrade basic and academic technical education in science and engineering.

g. Exports. It may be that, for certain types of processing equipment for which there is a substantial domestic demand and which is relatively simple in design, Indonesia could secure export markets in neighbouring (and perhaps other) countries with the same raw material producing and processing industries. Exploration of such export opportunities at the selection stage, and in feasibility studies, and active assistance and training in export marketing once the industry goes into production, may significantly improve prospects. As has been suggested earlier in this report, ASEAN industrial complementation arrangements may provide the ideal framework for such initiatives on a reciprocal basis.

h. Technical Assistance. If, as has been suggested above, Indonesian capital goods industry development must, in the short and medium run, rely heavily on technical assistance from abroad, efforts should be made from the start to involve domestic enterprises and local staff to secure maximum transfer of knowhow. The integrated approach which has already been adopted in the sugar industry and which has been recommended in Part Four, Volume III, for several other industries may often be suitable for this purpose. More generally, the involvement can take the form of employment of local staff in increasingly responsible positions in direct investment or management contract arrangements with multinational enterprises or as members of foreign consultancy or technical assistance teams.

There are a number of ways in which UNIDO may be able to contribute to such technical assistance and help Indonesia in the design and execution of the policy measures which have been recommended. More specifically:

a. UNIDO may be able to assist with the technical assistance programme for the development of general engineering contractor approach to equipment processing for certain industries recommended in Part Four Volume III.

b. UNIDO could advise and assist the programme for technology transfer, management and the building up of engineering capability for processing equipment production recommended in Part Four Volume III.

c. For most types of processing equipment, studies of economic, and in some cases also technical, feasibility have been recommended before any firm decisions are taken. UNIDO could assist in the preparation of such feasibility studies and sub-sector analyses as well as in the preparation of a sectoral plan for development of the capital goods industry.

d. A review of overall progress and prospects of the Indonesian industrial sector and analyses of selected priority issues of industrial policy and strategy, may be desirable halfway during Repelita IV, say in 1987, with a view to providing a sound analytical basis for Repelita V. UNIDO may be able to undertake such a review.

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